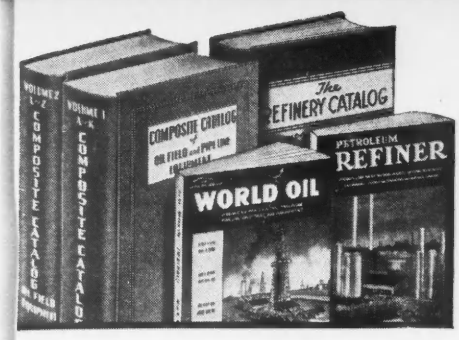

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WORLD OIL and The COMPOSITE CATALOG
for the drilling-producing-pipe line industry

PETROLEUM REFINER and The REFINERY CATALOG
for the refining-natural gasoline industry

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HOW TO ALLOCATE IMPORTS?

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We are in agreement with those who have written that no nation in a rational state of mind should permit an important domestic industry to be destroyed by imports. We do not think that any other nation in the world, except one administered by puny-minded persons, would permit such destruction.

The question at this point is "what is destructive?" Senator Thomas thinks that imports of 5 percent of domestic demand would *not* be destructive. We are inclined to agree with him that such a figure on imports would not hurt the domestic industry. Last year imports amounted to 8.9 percent of domestic demand, and in the first five months of 1949 constituted 10.3 percent of domestic demand.

But the settlement proposed by Senator Thomas is not as easy or practical as might be thought.

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On the basis of past imports? That would put the company getting ready to import in an unfair position. It might well start off with unfairness all down the line because we know of one company operating in South America which has brought practically every barrel of its South American production into the U. S. while other companies with far larger production have sent part of their oil to the U. S. and have developed markets abroad for the remainder. One of the companies of the latter class—probably more than one—has cut down substantially on its production from the country in question while the first company referred to has not.

How will allocations between countries be determined? Here, the State Department could easily become involved.

If a new country, say Canada, located nearby and on the most friendly terms to the U. S., should grow into the exporting class, as Canada surely will within a short time, how will she share? Whose allocation will be cut to take care of Canada?

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Ray L. Dudley

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Ray L. Dudley

REPORT FROM
THE OBSERVATORY

Reversal of Downward Trends in Demand, P

By **RAY L. DUDLEY**, Publisher, and **WARREN L. BAKER**, Editor

SHARP REVERSAL of the downward trends in demand, crude production and refinery runs is immediately ahead for the U. S. petroleum industry. Substantial gains in consuming and producing rates are to feature the industry's operations during the remainder of the year. With recent upward revisions indicating demand in the fourth quarter of 1949 likely to exceed year ago levels by appreciable amounts, as much as two-thirds of the production cutbacks may need to be restored by the end of the year.

While these prospects make the industry's short-range outlook the brightest in nearly a year, a cautious attitude must be taken for the long-range viewpoint. Since refinery runs are to be higher in coming months, it becomes imperative that refinery product yields be rapidly and radically adjusted to produce larger volumes of fuel oils and smaller quantities of gasoline in order to avoid manufacturing far too much motor fuel. Present refined product prices are the fly in the ointment; gasoline is profitable and fuel oils are not. Unless better fuel oil prices materialize to make it economically sensible to reduce gasoline yields, there is danger that not enough refineries will stepup yields of fuel oils.

• • •

LARGE PRODUCTION GAINS are indicated for forthcoming months. It is generally agreed that demand for petroleum products will hit an all-time peak of 6½ to 6¾ million barrels daily during the last quarter of 1949, compared with a present level of approximately 6 million barrels per day. To meet such an increase, crude runs to refinery stills are expected to climb from their August level of 5¼ million barrels daily to 5¾ million barrels by the end of the year. This means a demand for 700,000 to 750,000 barrels more crude oil than was produced in July and August. Such a gain would restore two-thirds of the production cuts made since the first of the year, and would still permit withdrawal of refined products from storage during the winter months.

Recent crude oil trends have been highly favorable. Crude stocks on August 13, latest figure available, were the lowest since mid-March, amounting to 268¾ million barrels. At this level, they were 3,420,000 barrels (122,000 barrels daily) lower than on July 23, and 6,220,000 barrels less than on June 18.

Since recent drafts on crude stocks have reduced them to near the 260-265 million level considered by the industry as the desirable volume, additional gains in demand must be supplied by enlargement of producing rates. The first move toward higher production allowables will occur in September, when output should be about 140,000 barrels per day higher than in August. Texas will contribute approximately 130,000 barrels of this increase, and Kansas the other 10,000 barrels, according to newly fixed state production allowables. Additional production gains are to come in following months.

With prospective increased demand to require enlarged producing rates, crude oil prices are safe for the time being.

• • •

REFINED PRODUCTS also have experienced favorable trends recently. Distillate and residual fuel oil inventories no longer are excessive, although there is danger that gasoline stocks may become too large during the forthcoming off-season winter months.

An outstanding feature of petroleum trends in recent weeks has been improvement in the residual fuel oil picture for the territory east of California. Due to additions in California, total residual stocks in the U. S. amounted to 68,157,000 barrels on August 20, at which point they were 16 million barrels above a year ago. However, the residual situation east of California was entirely different. Heavy sales were occurring, as low prices encouraged utility and industrial users to convert from coal. Consequently, residual fuel stocks outside of California declined to levels below year ago volumes. During the past month residual oil inventories east of California declined from 31⅔ million barrels to 29½ million barrels on August 20, which was in contrast with 32¼ million barrels on hand a year ago. Two months ago, stocks east of California were 6½ million barrels above 1948 levels.

The position of distillate fuel oil stocks also has shown substantial improvement in recent weeks. These stocks have not been accumulating as rapidly

, Production and Refinery Runs Just Ahead

WORLD OIL'S summary of the oil situation at the close of August

as in 1948. August 28 they stood at slightly more than 75 million barrels, 16¼ million barrels above a year ago, whereas they were 19 million barrels greater a few months ago. Again the situation was better east of California than indicated by the national picture. East of California, distillate fuel oil stocks were only 13 million barrels above a year ago on August 20, whereas they were 17 million barrels greater than a year ago as recently as July 16.

In view of anticipated sharp growth in heating oil consumption during the coming winter, which is expected to be up by at least 20 percent over last year, these stocks no longer are considered excessive. The present distillate fuel picture is very deceptive. Consumers and jobbers have held off normal summer buying, causing refinery stocks to increase. Deferment of consumer and dealer purchases will make itself felt with a vengence as cold weather approaches. Increased inquiries for heating oil during recent weeks indicate sales of this product may gain sharply in the immediate future, and might reach such a volume as to prevent any substantial additions to stocks in September and October despite enlarged refinery runs. If distillate demand during the forthcoming heating season should be more than 20 percent above a year ago, as many now are predicting, distillate stocks may prove inadequate.

The picture for gasoline is the one worrisome spot. With only one month left of the so-called touring season, gasoline stocks were 12½ million barrels above a year ago although a few weeks ago they were only 10½ million barrels above the corresponding period of 1948. Stocks of this product amounted to 107½ million barrels on August 20. Most suppliers would like to see gasoline stocks reduced to about 90 million barrels by the end of October. Under present yields this cannot be achieved, particularly since refinery runs are due to increase during the next two months. It appears that gasoline stocks are likely to be around 100 million barrels at the end of October, and thus be in position where they could easily become excessive when additions occur during the winter season.

• • •

THE PROBLEM AHEAD is the urgent need for immediate changing of refinery product yields to increase output of fuel oils and reduce the volume of gasoline made. If this is successfully accomplished, the industry can come through the winter in excellent economic position. Continuation of present yield patterns will result in the manufacture of far too much gasoline and too little distillate and residual fuel oils during the coming winter months. The necessity of increasing crude runs to stills to satisfy higher winter consuming rates intensifies the need for reducing gasoline yields and increasing fuel oil yields. Otherwise, stocks of gasoline will climb to such levels that a break in motor fuel prices will be inevitable by next March, and this would endanger the industry's entire price structure.

Gasoline yields recently have been the highest in history, averaging around 47.7 percent. A yield of 43 percent gasoline appears desirable for the coming winter. Present yields of distillates are 15.5 percent, whereas they should be increased to near 19 percent for the winter.

• • •

PRICE IS THE FACTOR which is controlling refinery product yields. As long as gasoline remains more profitable than heating oils and residual fuels, it will be difficult to get refiners to increase their output of fuel oils and reduce gasoline yields. Last winter, heating oil was 8 cents per gallon and gasoline was 9 to 10 cents a gallon. At present Gulf Coast postings, heating oil sells for 6¾ cents per gallon and gasoline for 10 cents a gallon. How many refiners will step up their yields of heating oil unless they receive a price which will give them the same margin of profit on fuel oil as on gasoline?

Opinion is divided as to the prospects for the industry to obtain higher distillate and residual fuel oil prices. Recent increases in fuel oil prices have been encouraging, and fast stabilization of these markets promise of additional price gains. During August, Gulf Coast cargo prices for No. 2 distillate advanced from 6 to 7 cents a gallon. As heavy movement of heating oils get under way, prices may increase more —but will they go high enough to encourage widespread and extensive adjustment of refinery yields?

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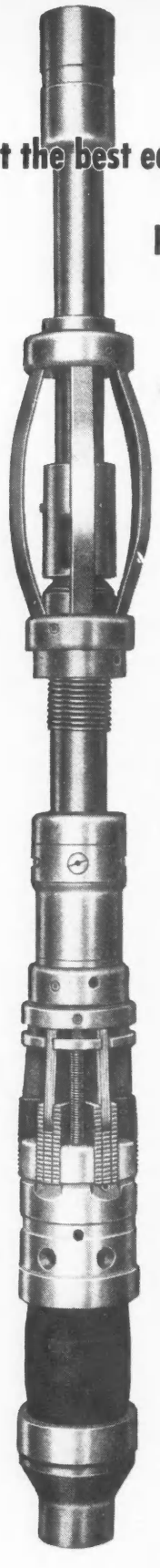

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The 17th edition is now on the press and distribution probably will begin before the next issue of WORLD OIL reaches its subscribers. Due to improvements in bindery procedure it is expected that mailings on the coming edition will take place more rapidly than ever before after the first copies are completed.

The 17th edition will surpass all previous efforts. It will contain in excess of 5100 pages, thus being some 700 pages larger than the last edition.

For the benefit of those who receive copies as well as those oil men who might have a use for it but have not received individual copies in the past, the distribution of *The Composite Catalog* is made to lists of key personnel who purchase or influence the selection of equipment (usually purchasing department men, engineers, superintendents, tool-pushers, and in some instances foremen), whose names are furnished by their companies for this purpose. Every active oil producing company, drilling contractor, independent producer, pipe line company and pipe line contracting company, at home and abroad, on which we have information is sent a "request sheet" on which it puts the names, titles and addresses of the person or persons for whom it wishes complimentary copies of *The Composite Catalog.* The company sending in the name or names must also furnish information on the extent of its operations, average daily production, number of producing wells, number of wells drilled during the previous year; in the case of drilling contractors the number of rigs owned, type of rigs, number of rigs running, and number of wells drilled on contract during the previous year. In the case of pipe line companies, data on mileage, etc., are required. This information, which is not published, but maintained as a part of our own records, is used to determine whether the number of copies requested is adequate or too much, and to help us calculate the percentage of operations covered by *Composite Catalog* distribution.

Inasmuch as the cost of producing and mailing a set of *The Composite Catalog* is now in excess of $30 and they are mailed free (the manufacturers in effect paying for the catalog through the fee they pay us for their insertion of their own catalogs in *The Composite Catalog,* an operator naturally must have adequate operations to warrant the mailing of a free copy. It sometimes happens that we have requests which we would like very much to fill, but are unable to do so because the extent of the operations of the company or individual requesting the copy will not warrant mailing it.

COPIES ARE PLACED in all supply stores in order that operators and employes not receiving individual copies may still have access to it. The supply store men tell us that they are always glad to have the oil men in their areas use the store copy. One supply store manager a year or two ago hazarded the estimate that the copy in his store was referred to "several thousand times a year." We think that that was an exception, but it is common practice for a supply store manager either to refer to it several times a day or have men come in and ask to be allowed to look up items they have under consideration.

The new *Composite Catalog* is a gigantic production job . . . one of the biggest of its kind done this year in the U. S. In excess of a quarter million pounds of paper and ink are used in its printing, the ink alone running into the tons. Its mailing costs (increased this year by reason of new postal rates) will run into the tens of thousands of dollars. In addition to the day and night time spent in producing *The Composite Catalog* in our own large modern printing plant in Houston, six other plants were called into play to complete the edition which will shortly be ready for mailing.

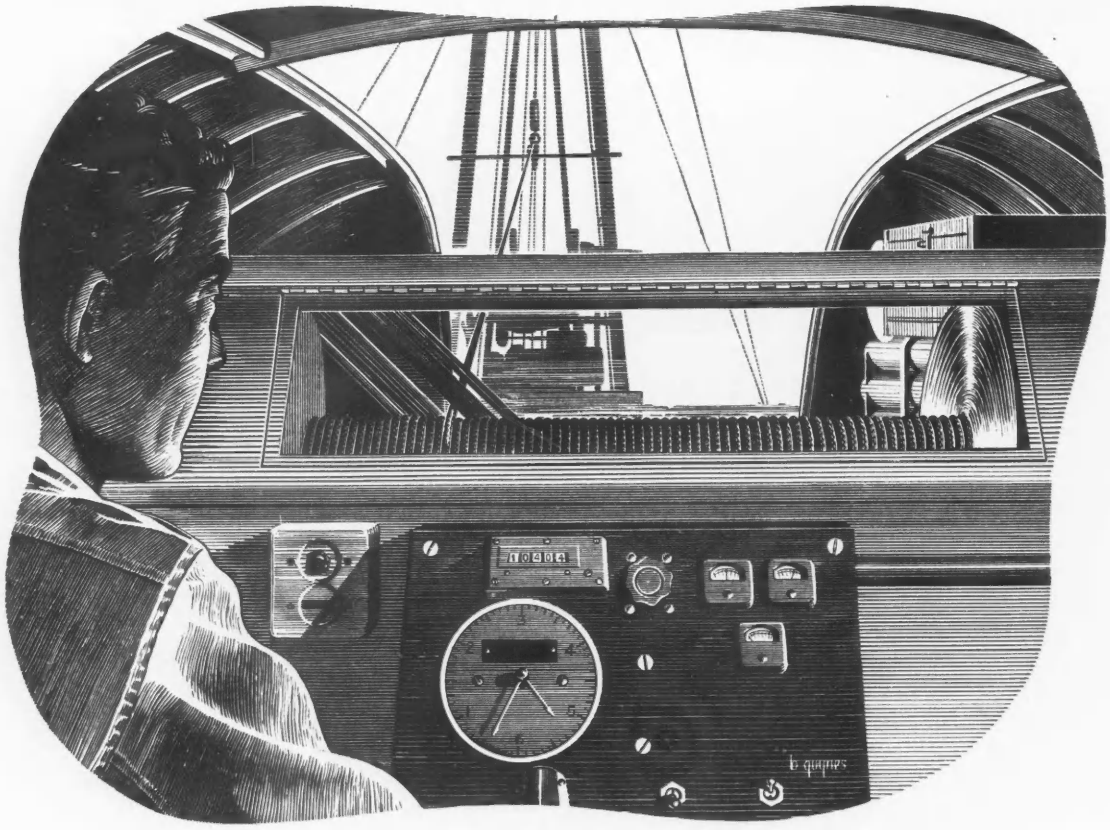
All the foregoing is not said in a spirit of braggadocio. Actually, the idea was not a new one when we started publishing *The Composite Catalog.* We simply applied an idea already successful in another industry and went to work. The success of *The Composite Catalog* (because it has been tremendously successful from the standpoint of what has been accomplished) may be attributed to three things:

1. The idea fitted the oil industry like a glove.
2. Oil companies and their employes all over the world welcomed it as a time saver in checking on equipment and services described in it.
3. The manufacturers and service companies were quick to recognize that it offered the best possible solution to their difficult cataloging problem.

If your individual copy does not reach you within the next month, do not be impatient. The job of gathering and binding a double volume of the size of *The Composite Catalog,* even with the new method we are using this year, takes time.

But we know you will like it when it is in service . . . and that you can carry on any kind of oil field or pipe line operation with the equipment described in it by the manufacturers and service companies. The data in it are published just as it comes from the manufacturer or service company and is thoroughly authentic.

Warren L. Baker



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Monthly News Analysis

COMPANY EARNINGS DOWN . . . CRUDE AND PRODUCTS REQUIREMENTS UP
TEXAS RAISES SEPTEMBER ALLOWABLES . . . IMPORTS MAY BE REDUCED

Industry Earnings Are Down During First Half of Year

Tabulation of the reported results of 25 oil companies shows that in the aggregate they had net earnings of $644,168,974 in the first six months of 1949, a decrease of 26.9 percent from the record-setting $881,455,502 that they earned in the first half of 1948. Although down from last year, this year's profits were substantially better than in the initial half of 1947.

Only one of the 25 companies showed an increase in earnings this year—Richfield Oil Corporation, but only slight decreases were reported by Standard Oil Company of California and Standard Oil Company of Kentucky. Another California concern, Union Oil Company of California, had a 26.9 percent decrease, the same as the 25-company average.

Decreases were only 10 to 20 percent for Houston Oil Company of Texas, The Ohio Oil Company, Lion Oil Company, Texas Pacific Coal and Oil Company, and Seaboard Oil Company of Delaware.

Declines in earnings this year were between 20 and 30 percent, or close to the industry average, for Atlantic Refining Company, Continental Oil Company, Plymouth Oil Company, Skelly Oil Company, Standard Oil Company (Indiana), Tide Water Associated Oil Company, and Union Oil Company of California.

Earnings were down for this year's first half by 30 to 40 percent for Amerada Petroleum Corporation, Anderson-Prichard Oil Company, Deep Rock Oil Corporation, Gulf Oil Corporation, Phillips Petroleum Company, The Pure Oil Company, Shell Union Oil Corporation, Socony-Vacuum Oil Company and Standard Oil Company (N. J.), while Sun Oil Company showed a decrease of 44 percent.

The lower earnings in this year's first six months, compared with the first half of 1948, reflected the reduced crude oil production and refinery runs and lower sales and prices of light and heavy fuel oils.

Switching from Coal Boosts Use of Residual Fuel Oil

The definitely improved market for residual fuel oil has been evidenced in recent statistics as well as market developments. Materially increased use of fuel oil by electric utility power plants was shown in statistics for June. The Federal Power Commission reported that those plants during June consumed 4,987,094 barrels of fuel oil, a record for that month. This consumption was 20 percent above the previous month and 62 percent above June 1948. Fuel oil stocks on hand at those plants on July 1 totaled 8,072,314 barrels, equivalent to 49 days' supply based on June use, compared with 60 days' supply a month before and 79 days' supply a year previously.

Since the middle of the year, the demand for fuel oil has continnued strong. Except in California, where there is a surplus, stocks of residual fuel oil now appear low in relation to prospective demand. Stocks east of California are only slightly higher than a year ago. To guard against scarcity next winter, Eastern marketers have increased residual imports and have raised prices for purchases on the Gulf Coast 15 cents a barrel. On the East Coast, marketers increased the price of No. 6 fuel oil 10 cents a barrel in early August on all methods of distribution.

The improved demand for fuel oil is primarily the result of the sharp reduction of prices this year. Utilities and other consumers have made important markets for fuel oil by switching from coal to oil as fuel. The conversions have been made primarily because oil has become in many cases a cheaper fuel than coal, although they have been encouraged also by the threat of coal strikes and coal scarcity.

Higher Crude Production and Runs to Stills Are Needed

Material increases in U. S. crude production and refinery runs will be required during coming months, it is indicated by the revised forecast of supply and demand for the year which the Bureau of Mines released August 9. The Bureau warned that if current low rates of refinery runs are continued too long, serious congestion of oil distribution facilities may occur next winter and it may be necessary at that time to make extreme readjustments in yields.

An important factor requiring the stepping up of operations is the expectation that demand for heating oils during the coming winter will be about 20 percent greater than in the winter of 1948-1949.

Although U. S. crude production averaged only 4,730,950 barrels daily in the week ended July 30, as reported by the American Petroleum Institute, it should average about 400,000 barrels per day more than that for the third quarter and show a further increase of over 300,000 daily for the fourth quarter, the Bureau of Mines forecast indicates. The demand for domestic crude is computed by the Bureau at 5,135,000 barrels daily for the third quarter and 5,455,000 daily for the fourth quarter. These estimates assume a 10 million barrel reduction in crude stocks in the third quarter and no change in crude stocks in the fourth quarter. Domestic crude production in the third quarter of 1948 averaged 5,512,000 barrels daily and in the fourth quarter 5,618,000 daily, having been at an all time peak of 5,688,000 daily in December. The estimate of 5,455,000 daily of domestic crude to be required in this years final quarter is only 163,000 per day under last year's fourth quarter.

In estimating the requirements of domestic crude, the Bureau assumed continuance of recent trends of imports, estimating total imports of 558,000 barrels daily in the third quarter and 565,000 daily in the fourth quarter.

U. S. refinery runs of crude averaged 5,187,000 barrels daily in the final week of July, the API reported. According to the Bureau forecast, runs to stills should average 5,360,000 barrels daily in the third quarter and 5,700,000 daily in the fourth quarter, to balance supply with demand. Actual runs last year average 5,544,000 daily in the third quarter and 5,622,000 daily in the fourth quarter, reaching a peak of 5.688,000 per day in December. These date indicate that runs to stills may have to be increased to new record levels in the latter part of this year.

In making these estimates of needed supply, the Bureau made revised forecasts of demand for the various petroleum products by quarters and for the whole year 1949. The forecast assumes normal weather in the latter half of the year and indicates that total demand for all oils in that period will be 5.9 percent larger than in the latter half of 1948,

with exports 5 percent lower and domestic demand 6.6 percent greater.

For the whole year 1949, the Bureau's revised forecast indicates an increase of 1.6 percent in the total demand for all oils, as compared with 1948, with exports expected to be off 1.6 percent and domestic demand up 1.8 percent. The domestic demand in 1949 is expected to reflect increases of 5.6 percent for motor fuel and 2.9 percent for distillate fuel oil and declines of 2 percent for residual fuel oil, 7 percent for kerosine, and 1 percent for all other products.

In the first half of 1949, total demand for all oils was down 2.7 percent from the initial half of 1948, the Bureau reported, with exports up 1.7 percent and domestic demand down 3 percent. In domestic demand, motor fuel was up 5.4 percent, but there were declines of 6.8 percent for residual fuel oil, 9.2 percent for distillate fuel oil, 17.8 percent for kerosine, and 6.4 percent for all other products, with mild weather and cautious buying of distributors and consumers holding down fuel oil sales. In this year's first half, crude runs were off 4.5 percent because of lower demand and large refinery stocks, and crude production was down 6.7 percent, due to lower runs, more natural gasoline production, higher crude imports, and lower crude exports.

In comparing the supply situation in 1949 with that in 1948, said the Bureau, it should be remembered that in 1948 the supply of all oils exceeded total demand by 105.6 million barrels, or 4 percent, that amount having been added to storage. "From present indications," stated the report, "total production in 1949 may decline 4.7 percent, including a decrease in domestic crude production of 5.7 percent and a gain in output of light oils from natural gas of 8 percent; imports, on the basis of actual and current trends, may increase by at least 11 percent; and a substantial reduction in refined stocks seems probable."

Texas Production Allowables Granted Sizable Increase

Oil allowables for September have been increased by the Texas Railroad Commission to 2,077,905 barrels per day for Texas producers. This represents a daily increase of 132,268 barrels over the previous allowable of 1,945,637 barrels per day.

The Commission's action was based apparently on the expected normal winter weather, which will bring an increased demand for fuel oils. The rise in allowables was the first optimistic step taken by the Commission since it began nominal cuts in July, 1948. Except for a minor increase in September of last year, the cuts continued, with heavy reductions from January through August dropping Texas production approximately 850,000 barrels daily.

The increased production rate is achieved through a revision of producing schedules. This provides 18 general producing days and 16 in the East Texas field during the 30-day month of September.

Reduction of Imports from Middle East Is Indicated

Some promise of reduction of petroleum imports was indicated by statement of Standard Oil Company (N. J.) that it has no present plans for further importation of Middle East crude. The company in August received a tanker of Kuwait crude which completed shipments under its only Middle East crude imports contract. It stated that the contract had been made with Angle-Iranian Oil Company in early 1948 "to assure adequate supplies of oil products," at a time when world crude production was "somewhat short of demand." Highest receipts under the contract were an average of 88,377 barrels per day in February 1949.

Following the Jersey Standard statement about termination of its Middle East imports, Fred W. Shield, president of Independent Petroleum Association of America, said the action would not provide relief if the company should substitute imports from Venezuela or other foreign sources in place of the Middle East oil. He said the amount involved represents less than 10 percent of present total U. S. imports.

Latest government figures on petroleum imports had brought new protests from officials of the IPAA. The figures showed that total imports averaged 607,000 barrels daily in the second quarter of this year, the highest quarterly rate in history. In the first quarter of 1949 total imports averaged 600,000 barrels daily and in the fourth quarter of 1948 they averaged 581,000 daily. The 607,000 daily for this year's second quarter compared with 478,000 daily in last year's second quarter. Total imports averaged 610,000 barrels daily in April of this year, 580,000 daily in May, and 632,000 daily in June. These statistics are from the U. S. Department of Commerce.

The total imports of 607,000 barrels daily in the second quarter of this year included 270,000 daily from Venezuela, 181,000 for the Netherlands West Indies, 98,000 from the Middle East, 29,000 from Colombia, 25,000 from Mexico, and 4000 from all other countries.

NPC Studies Imports and Reserve Producing Ability

The National Petroleum Council has set up two committees to make studies of two matters of great importance to the industry and the nation. Reports on these studies will be awaited with much interest. One committee will make a study of the nation's reserve oil producing ability, and the other will study the problem of petroleum imports. The studies were undertaken at the request of Secretary of Interior J. A. Krug. He asked that the problems be thoroughly studied and that the council make reports of its findings and offer recommendations regarding these matters.

Although the subjects will be studied separately, they are inter-related to a considerable extent. In their present vigorous fight for limitations on imports independent operators assert that large imports will stifle the domestic industry and make it unable to supply all the petroleum that may be needed in national emergencies.

The NPC committee for studying crude petroleum reserve producing capacity includes 17 members, with L. F. McCollum, president of Continental Oil Company, as chairman. There are 24 members of the NPC committee for studying the effect of imports on the domestic industry, the domestic economy, and the national security. Chairman of the imports committee is George A. Hill, Jr., president of Houston Oil Company.

California Suspends Permits For Shooting Offshore Wells

Because of damage to marine life as well as to residences along the coast of Ventura and Santa Barbara counties, the California Fish and Game Commission has suspended issuance of offshore shooting permits. The State Lands Commission plans to make a complete investigation of the extent of damages occurring, and also will study practicability of alternative methods of submarine exploration work.

Public Relations Program Demonstrates Good Results

Effective results are being derived from the oil industry's public relations program, with the public being led to realize how it benefits from the industry's operations and progressive policies. These results were shown when the Oil Industry Information Committee reported on its work to the Public Relations Committee of the American Petroleum Institute board of directors at Washington recently.

Over 4000 volunteer oil men, 5000 companies, and 101 trade associations now are participating in the program. Oil industry slide films have been shown to almost 2000 audiences. More than 28 million pieces of literature containing information about petroleum have been

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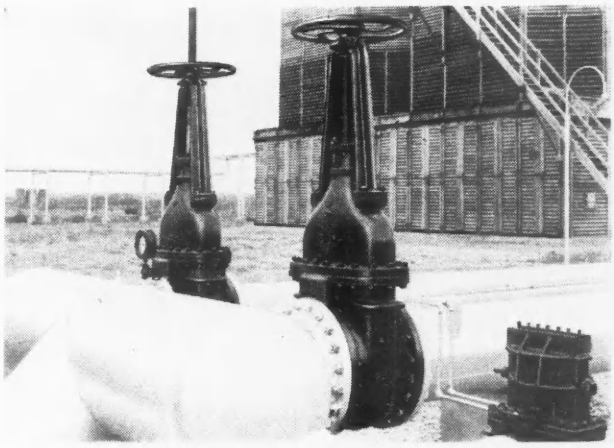

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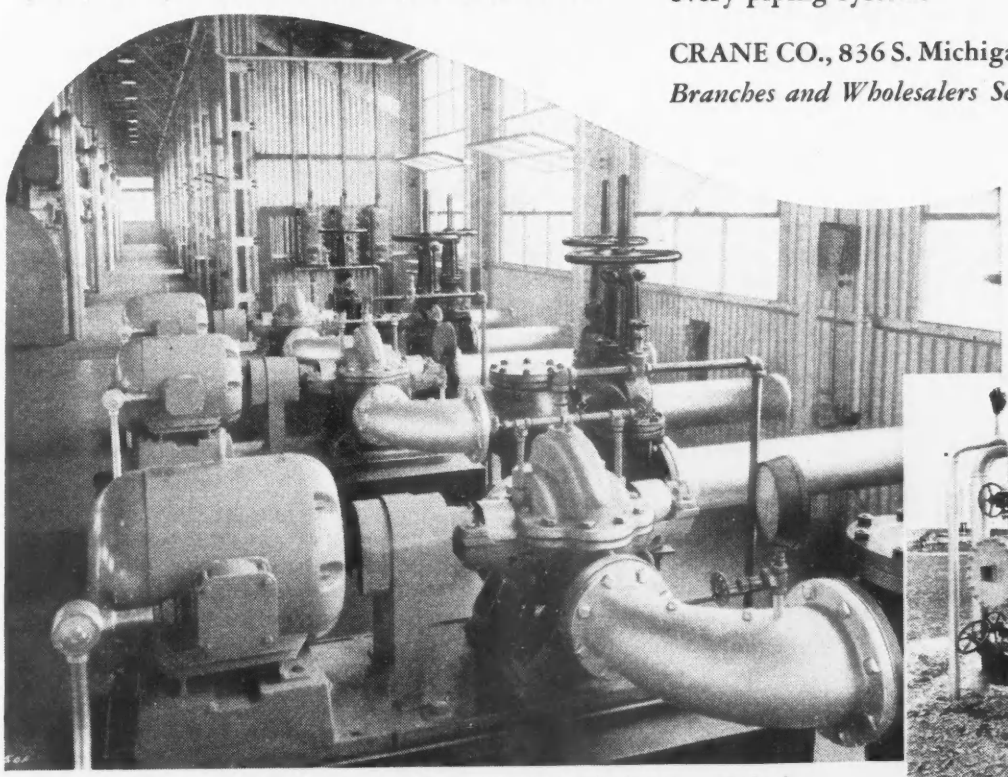

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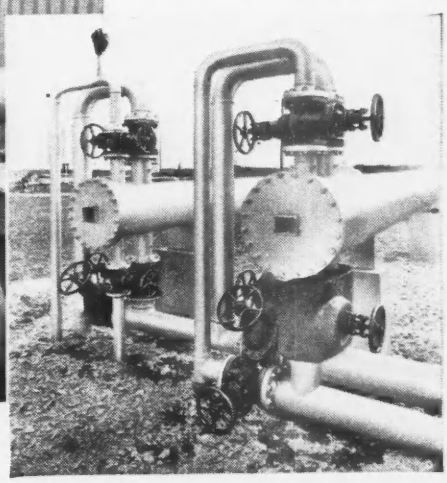

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distributed throughout the country. Newspapers and magazines with combined circulation exceeding 1 billion have carried news stories and advertisements dealing with the oil industry and its products, its "good citizenship," and its acceptance of its social responsibilities. About 3500 speeches have been made by oil men before public groups.

The public relations program will be continued through 1950 under its present setup, but oil company executives will be in closer touch with the activities. Henceforth, OIIC will make oral reports at least twice a year to the API Public Relations Committee, and from two to five members of the API committee will meet with OIIC at each of its future sessions. They will report back to the full board and keep members fully informed on OIIC activities as they develop.

OIIC will be expanded in 1950 to 35 members by adding the 12 district chairmen as full members. This is intended to provide closer relationship between national and field activities.

The API Public Relations Committee also gave consideration to a long-range policy proposed by OIIC Chairman Conger Reynolds, aimed at decentralization of the program. Under the plan, each district ultimately would be made completely autonomous, with each district financing and directing its own program.

New Arrangements Required In Foreign Oil Operations

The oil industry of the U. S. will have to make difficult and costly readjustments in connection with world trade in oil as aid to Europe under the Marshall Plan proceeds. This prospect was discussed before the National Petroleum Council at Washington by Walter J. Levy, until recently chief of the petroleum branch of the Economic Cooperation Administration.

Without ECA operations, he asserted, American exports of oil to the participating countries could not have been maintained at the prevailing levels.

While the Marshall Plan has been holding up American exports to Europe, said Levy, it is only giving the American oil exporter some time to recognize and deal with a "world wide dollar problem which threatens his very existence." He expressed belief arrangements can be made, though they may involve "costly readjustments" to protect American outlets without retarding European recovery.

The important thing that the American oil industry must recognize, said Levy, is that it cannot sell oil to markets that cannot afford to pay for it. If it desires foreign markets, it must be willing to try to work out arrangements to make that trade possible.

Although Europe has been a large importer of American oil and foreign oil controlled by Americans, the European nationals now hold large oil reserves in the Middle East and in the Western Hemisphere. They naturally are desirous of developing these resources to meet their own needs and to supply export markets. This situation may mean, said Levy, lower American oil exports to Europe, more competition of European-controlled oil with American-controlled oil in world markets, and possibly increased oil imports into the U. S.

In aiding expansion of European oil facilities, ECA is seeking to limit aid to facilities that can sell output without discriminatory trade or currency practices and without other restrictive trade devices, stated Levy. ECA is perturbed, he said, about the recent commercial agreement between Argentina and the United Kingdom, which may shut American oil out of Argentina for the next five years. Instead of such bilateral trade agreements, ECA seeks multilateral trade agreements, relaxation of trade restrictions, and increasing convertibility of currencies. ECA is continuing discussions with French and Dutch officials, asking them to scale down ambitious plans for refinery expansion.

American Tankers Now Idle Total One-Fifth of Fleet

More than 100 U.S. flag tankers were in laid-up status in various U.S. ports in August. The number of idle carriers now represents one-fifth of the country's privately owned tanker fleet, and the inactivity has thrown more than 5000 officers and seamen out of work, according to the American Merchant Marine Institute.

The number of laid-up tankers has increased steadily since late 1948, due chiefly to the mild 1948-1949 winter with consequent lessening of heating oil demand on the Atlantic coast. Record coal production abroad also has contributed to the situation.

The Institute blamed the shipping policy of the Economic Cooperation Administration for the decline in world use of U.S. flag tankers, since the government has failed to see that privately-owned ships receive a fair share of cargoes transported with the aid of government funds. The Institute added:

"The greater volume of petroleum products, purchased through ECA or other funds, is secured from regions other than the U.S. Under the Foreign Assistance Act of 1948, American-flag participation in these so-called indirect trades is not provided for.

"The Maritime Commission's failure to amend promptly its regulations adopted during the oil shortage of 1947-1948 restricting the use of U.S.-flag tankers, deprived American owners of the opportunity of sharing to a greater extent the transportation needs of other countries. As a result, foreign-flag operators were able to secure remunerative employment for long periods ahead."

Despite the increasing number of laid-up tankers, 55 new tankers totalling 1,465,525 deadweight tons were under construction in U.S. yards last month. Many of these are the new "super" tankers of 28,000 tons with a 240,000-barrel carrying capacity.

The world's tanker fleet at mid-year aggregated 24,909,299 deadweight tons, with the U.S. leading all other nations with 8,550,394 tons. Three other nations are over the million-ton mark: Great Britain, 5,869,406; Norway, 3,067,871; and Panama, 2,377,444 tons. The world tanker fleet has increased by 1 million tons since the first of this year, and has grown by more than 50 percent over July, 1939, levels.

Rules to Be Issued for Texas Gas Measurement

The Texas Railroad Commission recently held in Austin the first of a series of hearings for bringing out facts and evidence upon which to base orders and rules for measuring gas under the new Texas standard gas measurement law, which becomes effective September 27.

For tax purposes and for making payments to lease and royalty owners, volumes of gas produced in Texas are to be determined and accounted for according to the new law, which defines a standard cubic foot of gas as the volume of gas contained in one cubic foot at 60° F. and at 14.65 pounds per square inch absolute.

The Railroad Commission is required by the law to determine the average temperature of gas in each oil and gas field and to determine other variable factors necessary to compute volumes on the standard basis, publishing its findings.

Because of limited time before effectiveness of the law, there was general agreement at the first hearing that the Commission should issue a statewide order covering as many of the factors as it could determine in statewide hearings before September 27 and subsequently hold district hearings for promulgation of special field orders.

The new law is intended to standardize measurement practices to assure producers and royalty owners payment for true volume of gas sold and to assure the state proper tax revenue from gas production.

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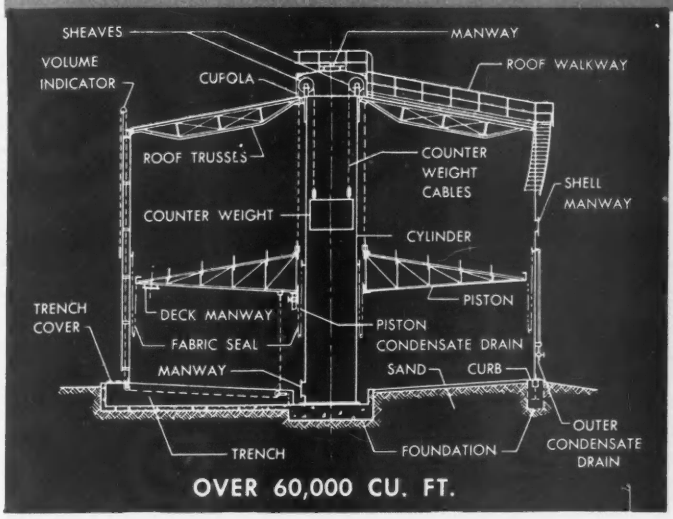

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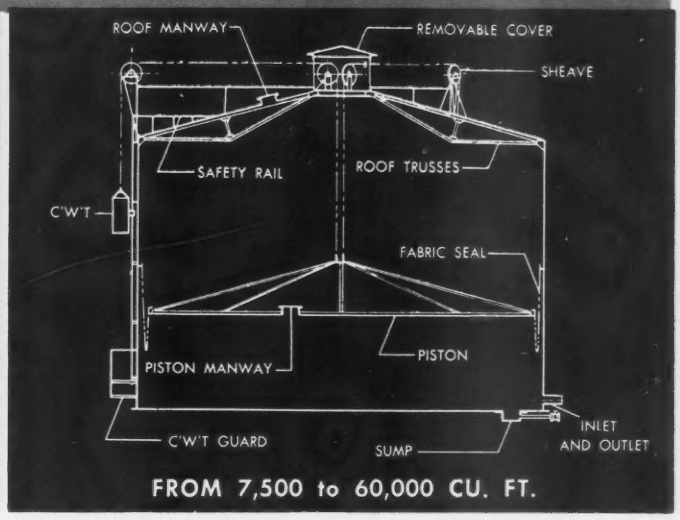

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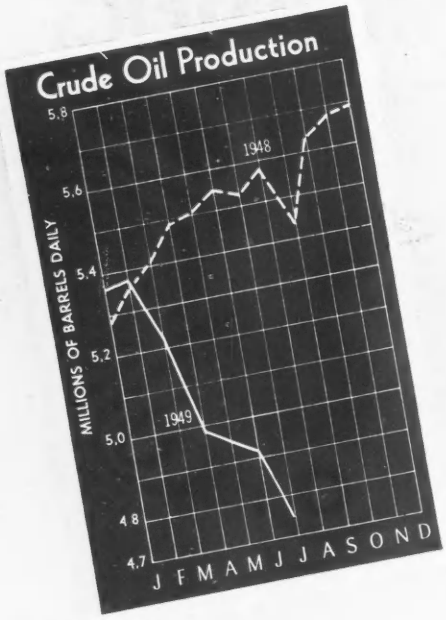
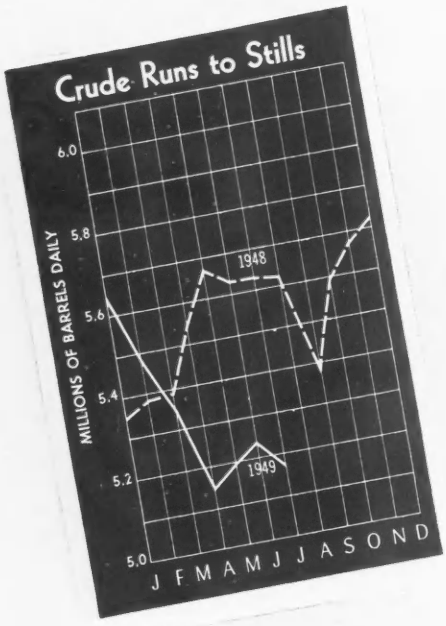
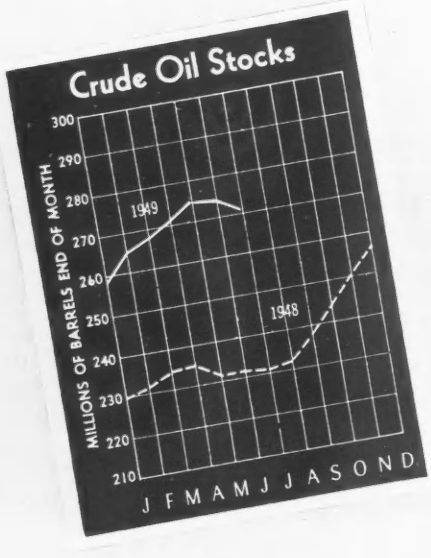






Crude Production at Lowest

By CECIL SMITH.

CRUDE production in July hit the lowest level since January, 1947, and as a result crude stocks were started downward after a full year of constant increase. The month also saw refiners lower their operations slightly, but by adjusting product yields produced more gasoline, the money product.

Gasoline stocks continued to be reduced during the month, but at a slightly lower rate than is usual for the season, and increased output was the standoff factor. These stocks could become burdensome if refinery yields are not adjusted in favor of the light heating oils, which could prove to be short in supply this winter if weather should be heavier than normal.

Buying of the distillates has been slow despite refiners' offers of future lowest-point billing and the big push to lay in fuel with the first cold snap could easily show local shortages. However, recent price hikes on light fuels in some regions should stimulate early purchases and result in more supplies moving into these consuming areas.

U. S. daily crude output averaged 4,738,000 barrels in July, a drop of 186,000 barrels a day from the previous month's rate, and the lowest level since January, 1947, when production was 4,625,000 daily. July's output was also 784,000 barrels a day less than was produced the same month a year ago.

Crude stocks totaled 271,387,000 barrels at the end of the month after dropping 2,869,000 barrels during the period. That was actually the first month in the past year that stocks showed a downward movement and later reports showed that inventories broke below the 270-million level early in August. However, crude in storage was still 40½ million barrels more than was held above ground a year earlier.

Refiners ran an average of 5,172,000 barrels a day to their stills, which was 64,000 less than had been processed a month earlier and 459,000 under daily runs a year before. That rate was not the lowest this year,

Crude Oil and Refined Products Trends

(THOUSANDS OF BARRELS)

MONTH	CRUDE OIL			GASOLINE		DISTILLATE FUEL		RESIDUAL FUEL	
	Production Daily	Runs to Stills Daily	Stocks End of Month	Production Daily	Stocks End of Month	Production Daily	Stocks End of Month	Production Daily	Stocks End of Month
1948:									
January	5,283	5,348	229,842	2,328	102,167	1,082	39,788	1,278	36,260
February	5,353	5,380	231,419	2,264	110,999	1,127	33,019	1,295	35,602
March	5,406	5,387	234,164	2,252	111,949	1,050	30,570	1,307	34,192
April	5,484	5,540	234,506	2,396	109,289	978	32,564	1,303	35,527
May	5,502	5,668	231,318	2,486	108,552	992	38,551	1,314	41,123
June	5,544	5,632	231,412	2,529	104,518	998	45,835	1,280	44,213
July	5,522	5,631	230,955	2,494	98,839	994	56,045	1,264	49,448
August	5,577	5,621	231,954	2,532	95,445	1,038	65,887	1,248	55,009
September	5,435	5,376	237,302	2,416	90,518	961	73,854	1,154	58,682
October	5,632	5,594	243,972	2,490	92,426	1,069	79,992	1,268	61,456
November	5,675	5,672	250,066	2,551	95,589	1,081	80,658	1,277	64,865
December	5,688	5,720	256,254	2,626	103,697	1,106	71,475	1,299	64,021
1949:									
January	5,365	5,641	258,648	2,538	116,621	1,063	61,584	1,348	62,508
February	5,376	5,480	265,216	2,484	126,054	1,004	53,937	1,282	59,398
March	5,224	5,352	269,341	2,470	127,443	933	48,923	1,258	58,190
April	5,012	5,141	272,520	2,494	125,351	846	51,231	1,147	59,668
May	4,972	5,195	273,912	2,585	121,602	813	57,442	1,138	63,576
June	4,924	5,236	274,256	2,591	114,490	779	64,148	1,128	65,857
July	4,738	5,172	271,387	2,609	109,747	839	71,070	1,084	67,182
July, 1949 Changes:									
In Month	—186	—64	—2,869	+18	—4,743	+60	+6,922	—44	+1,325
In Year	—784	—459	+40,432	+115	+10,908	—155	+15,025	—180	+17,734

Level Since January, 1947

Staff Writer

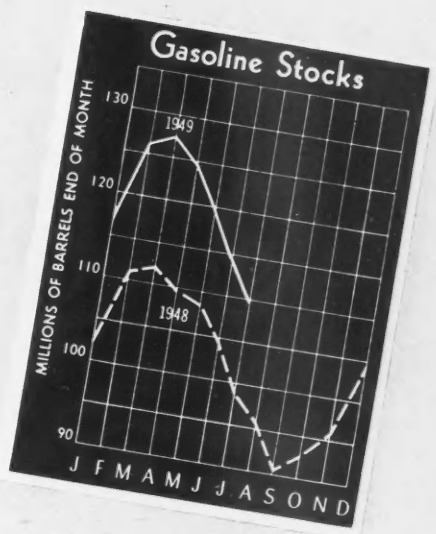
for an average of only 5,141,000 barrels was made in April. With that lone exception, refinery activity had not been so low since July, 1947. Early August reports indicated that refining had been increased moderately from July's rates.

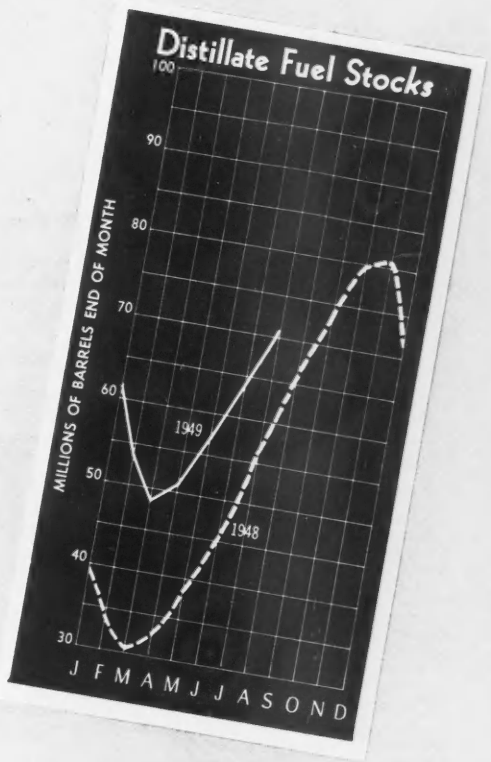
Higher refinery cuts from crude boosted gasoline output in July to 2,609,000 barrels a day, an increase of 18,000 a day from the previous month despite lowered refinery input. It is understandable that refiners would attempt to produce a maximum of the product bringing the higher price, which is gasoline, but very soon more attention will have to be given the light fuel oils which many industry economists believe could prove short if colder than normal weather is ahead.

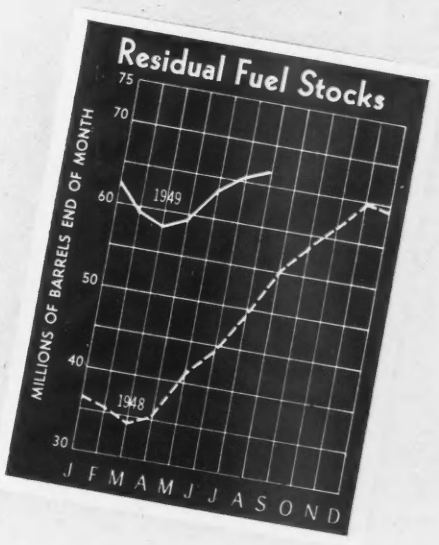
Gasoline stocks dropped 4,743,000 barrels in the month to total 109,747,000, which was 10,908,000 barrels or 11 percent more than was in storage a year before.

Stocks of distillate fuel oils gained 6,922,000 barrels during the period and totaled 71,070,000 at the close of the month. That amount was 15,025,000 barrels or about 26 percent greater than last year's stocks.

Heavy residual fuel stocks gained slightly during the month and totaled 67,182,000 barrels, which was 17,734,000 barrels more than the industry held a year ago, but California's stocks have increased more than 19 million barrels, which means that residual stocks are lower east of the Rockies than they were last year.







State Crude Oil Production

(THOUSANDS OF BARRELS)

STATE OR DISTRICT	DAILY AVERAGE PRODUCTION				TOTAL FIRST SEVEN MONTHS		
	July, 1949	June, 1949	July, 1948	% Diff. July '48-'49	1949	1948	% Diff. '48-'49
Alabama	1.2	1.2	1.2	.....	254	270	— 5.9
Arkansas	76.4	79.7	86.8	— 12.0	17,697	18,283	— 3.2
California	909.4	922.8	946.8	— 4.0	198,002	200,524	— 1.3
Colorado	66.6	64.4	47.1	+ 41.4	13,832	9,760	+ 41.7
Florida	1.4	1.4	0.8	+ 75.0	275	167	+ 64.7
Illinois	180.2	178.6	177.7	+ 1.4	37,184	37,120	+ 0.2
Indiana	27.1	25.0	18.4	+ 47.3	5,204	3,461	+ 50.4
Kansas	245.8	282.3	305.9	— 19.6	59,938	63,474	— 5.6
Kentucky	23.4	23.7	23.1	+ 1.3	4,880	4,984	— 2.1
Louisiana	493.1	517.3	496.9	— 0.8	109.675	103.320	+ 6.2
North Louisiana	110.8	116.0	117.9	— 6.0	25,528	24,837	+ 2.8
South Louisiana	382.3	401.3	379.0	+ 0.9	84,147	78,483	+ 7.2
Michigan	43.7	39.5	45.3	— 3.5	9,306	9,587	— 2.9
Mississippi	98.4	101.8	129.9	— 24.2	22,756	25,931	— 12.2
Missouri	0.1	0.1	0.2	— 50.0	24	32	— 25.0
Montana	25.5	26.4	26.6	— 4.1	5,459	5,340	+ 2.2
Nebraska	0.6	0.4	0.7	— 14.3	128	139	— 7.9
New Mexico	134.5	135.9	130.8	+ 2.8	28,385	27,377	+ 3.7
New York	13.9	14.1	12.8	+ 8.6	2,648	2,702	— 2.0
Ohio	9.9	10.0	9.2	+ 7.6	2,001	1,893	+ 5.7
Oklahoma	380.1	406.8	419.0	— 9.3	87,948	87,563	+ 0.4
Pennsylvania	27.5	29.8	34.9	— 21.2	6,603	7,433	— 11.2
Tennessee	.....	.....	.....	.....	4	4	.....
Texas	1,836.8	1,929.0	2,448.9	— 25.0	437,958	517,503	— 15.4
Dist. 1—South Central	25.7	26.1	28.9	— 36.1	5,594	5,689	— 1.7
Dist. 2—Middle Gulf	112.0	121.1	177.3	— 36.8	28,565	36,692	— 22.1
Dist. 3—Upper Gulf	351.1	370.5	491.2	— 28.5	85,554	105,312	— 18.8
Dist. 4—Lower Gulf-SW.	178.3	188.3	249.0	— 28.4	42,444	54,096	— 21.5
Dist. 5—East Central	32.5	34.6	48.3	— 32.7	8,219	9,724	— 15.5
Dist. 6—Northeast	305.7	329.8	424.8	— 28.0	76,454	91,855	— 16.8
Dist. 7-B—N. Central	57.6	59.7	49.3	+ 16.8	12,767	9,688	+ 31.8
Dist. 7-C—W. Central	41.5	42.2	42.9	— 3.3	9,505	9,412	+ 1.0
Dist. 8—West	501.4	527.3	691.0	— 27.4	122,200	144,393	— 15.4
Dist. 9—North	137.2	136.6	136.3	+ 0.7	27,934	29,680	— 5.9
Dist. 10—Panhandle	93.8	92.8	88.7	+ 5.7	19,069	18,429	+ 3.5
Utah	1.3	0.8	.....	.....	102	.....	.....
Virginia	0.1	0.1	.....	.....	22	24	— 8.3
West Virginia	7.9	8.2	7.5	+ 5.3	1,606	1,549	+ 3.7
Wyoming	133.5	124.8	152.0	— 12.2	26,770	30,767	— 13.0
Total United States	4,738.4	4,924.1	5,522.5	— 14.2	1,078,661	1,159,207	— 6.9

Completions

Hold Small Lead Over 1948 Record

WELL completions in July numbered 3316 to run the year's total to 22,073 and to maintain a small lead over last year's record operations. However, July's wells failed by 233 to equal the 3549 completions made in the same month a year ago and it now appears certain that it will be just a matter of a short time before the leadership again changes hands.

Although this year's total wells held a 2.4 percent advantage at the end of seven months, the lead amounted to 4.2 percent a month earlier, and a continued downward trend is indicated. The big difference in the two years' programs is that at this point a year ago the drilling rate was high and gaining momentum, but this years' appears to have passed its peak and is now giving ground.

Of course the above figures are for the U. S. as a whole and what is happening on the broad scale is not necessarily true for some of the leading drilling states. In fact the total U. S. trend is largely due to the large drilling cuts made in the Appalachian Region and which have been induced by lower crude prices.

On the other side of the books is Texas, which at the end of seven months held a lead of 24 percent over last year in the number of wells drilled. Even in this state drilling rates are being eased, but can be expected to show some recovery in the coming months as its allowable production rates are stepped up. Oklahoma is another leader that is maintaining higher activity and whose wells at present are five percent more numerous.

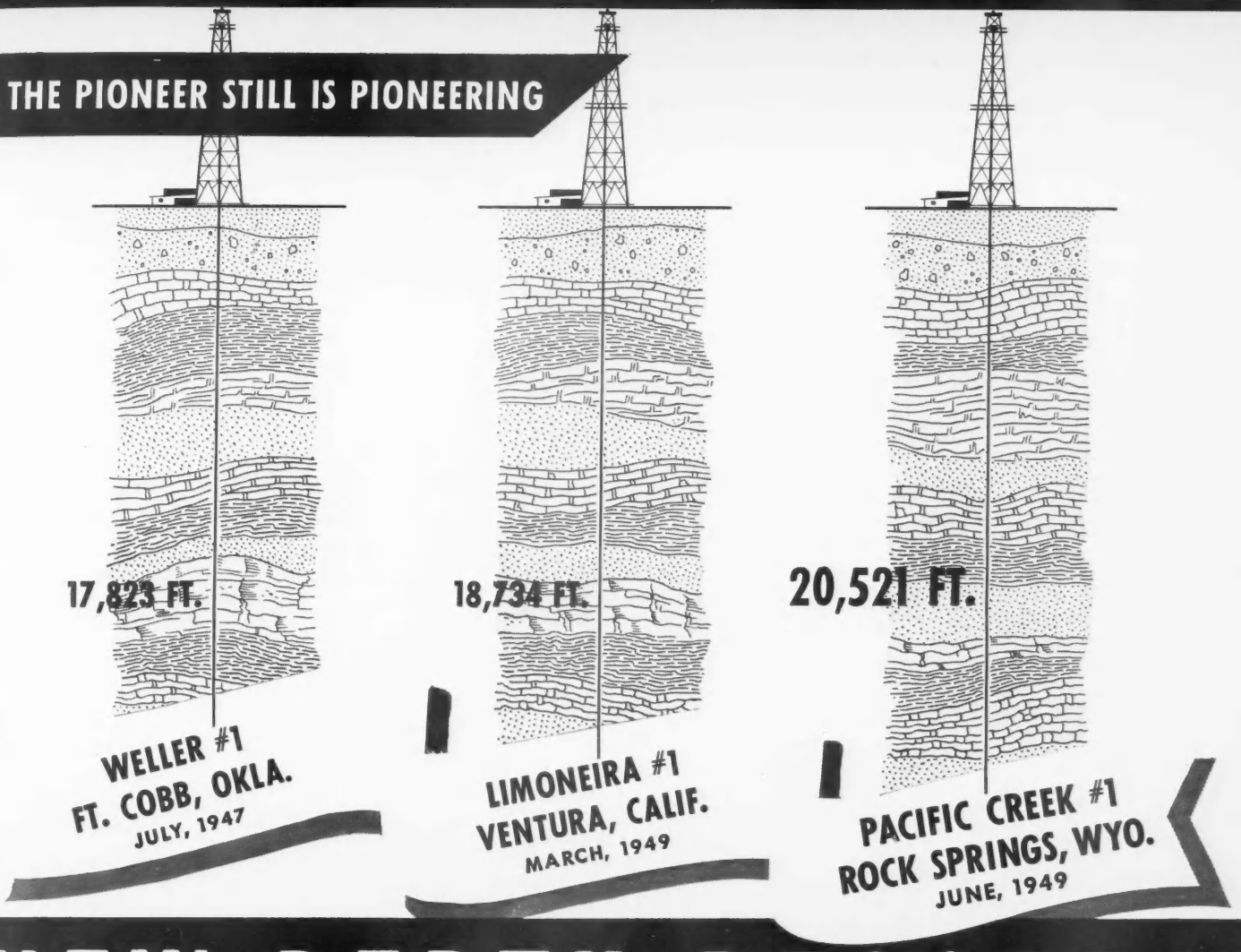
California, Louisiana, Michigan, Illinois, Indiana, Kentucky, and Wyoming are all drilling more wells this year and probably will continue to hold their leads, with the possible exception of California, which may have to cut back because of stockpiling of heavy crude oils.

Well Completions in the United States During July, 1949 and Cumulative for Year

(Figures compiled by WORLD OIL Staff from private reports and other sources as follows: Illinois from Illinois Geological Survey; Indiana from Indiana Division of Geology; Missouri from Missouri Geological Survey; Tennessee from Tennessee Division of Geology; Bradford, Kane-Clarendon and Allegany fields of Pennsylvania and New York from *The Producers Monthly*)

STATE OR DISTRICT	MONTHLY COMPLETIONS, JULY, 1949 — NEW WELLS: Oil	Dist.	Gas	Dry	Water Input	Gas Input	Water Disposal	Total New	Total Drilled Deeper	TOTAL COMPLETIONS: July, 1949	June, 1949	July, 1948	Footage July, 1949	CUMULATIVE TOTAL: Wells 1949	Wells 1948	Percent Diff.	Footage 1949	Rigs in Operation (Drilling, Rigging Up and Shut Down): July 31, 1949	June 30, 1949	July 31, 1948
Alabama				3				3	1	4		3	21,300	10	11	− 9.1	54,659	2	7	2
Arizona				1				1		1			3,730	4	1	+300.0	11,496	6	7	6
Arkansas	17			12				29		29	37	38	109,677	180	177	+ 1.7	725,691	27	27	45
California	130		3	40				173	3	176	263	216	747,688	1,531	1,491	+ 2.7	6,067,439	232	232	272
Colorado	1			6				7		7	4	18	24,348	35	142	− 75.4	143,087	20	20	46
Florida				1				1		1	1	4	3,140	10	16	− 37.5	60,871	4	3	5
Georgia														4	2	+100.0	12,437	1	1	
Illinois	156		1	129				286		286	253	279	682,608	1,396	1,309	+ 6.6	3,485,363	221	238	237
Indiana	45		1	70				116		116	97	104	217,622	647	569	+ 13.7	1,238,682	156	151	105
Kansas	141		60	103			3	307	1	308	262	261	1,048,260	1,672	1,670	+ 0.1	5,593,909	300	310	257
Kentucky	34		24	29				87		87	72	81	150,945	507	439	+ 15.5	915,537	88	85	88
Louisiana	130	14	17	60				221	3	224	215	196	1,266,720	1,212	1,220	− 0.7	6,958,067	208	211	214
North Louisiana	86	5	17	26				134	3	137	137	131	443,577	661	775	− 14.7	2,188,018	69	58	73
South Louisiana	44	9		34				87		87	78	65	823,143	551	445	+ 23.8	4,770,049	139	153	141
Maryland															1	−100.0				
Michigan	33		2	34				69		69	81	86	163,492	519	397	+ 30.7	1,176,527	123	120	118
Mississippi	8	1		12				21		21	34	38	144,155	198	231	− 14.3	1,469,711	28	23	48
Missouri				5				5		5		5	2,968	12	31	− 61.3	6,064	6	8	8
Montana	21	1	6	15				43	1	44	9	28	99,326	141	169	− 16.6	377,771	54	64	51
Nebraska											2			2	1	+100.0	7,109	3	3	2
Nevada																		1	1	1
New Mexico	18		1	3				22	1	23	40	43	114,680	301	367	− 18.0	1,298,254	86	93	102
New York	14				10			24		24	41	164	34,662	591	1,016	− 41.8	883,296	72	97	201
North Dakota																		3	1	
Ohio	32		21	23				76		76	70	106	137,739	595	731	− 18.6	1,299,941	155	141	213
Oklahoma	177	1	14	149			2	343	13	356	392	389	1,236,103	2,415	2,307	+ 4.7	8,671,443	457	461	556
Pennsylvania	41		36	11	31	10		129		129	145	273	250,137	1,211	1,867	− 35.1	2,159,107	208	239	421
South Dakota				1				1		1	1		4,080	2	1	+100.0	6,905	2	2	
Tennessee												4		14	32	− 56.3	14,376	6	6	18
Texas	769	24	44	370				1,207	17	1,224	1,283	1,083	4,828,579	8,218	6,638	+ 23.8	34,158,371	1,209	1,209	1,451
Dist. 1—S. Central	24		1	21				46	1	47	42	46	146,308	335	278	+ 20.5	990,737	34	37	40
Dist. 2—Middle Gulf	24	5	4	24				57	1	58	61	61	328,165	389	445	− 12.6	2,275,304	49	35	63
Dist. 3—Upper Gulf	61	9	9	39				118		118	138	96	715,334	783	602	+ 30.1	4,821,552	114	123	140
Dist. 4—Lower Gulf-SW	39	6	13	44				102	1	103	107	109	528,712	833	782	+ 6.5	4,116,739	96	95	130
Dist. 5—E. Central	6		1	8				15		15	11	17	62,082	132	117	+ 12.8	624,066	21	16	33
Dist. 6—Northeast	42	3	4	13				62		62	80	35	282,993	545	218	+150.0	2,375,210	49	34	45
Dist. 7-B—N. Central	98		2	74				174	2	176	186	123	471,033	1,137	758	+ 50.0	3,396,618	170	177	188
Dist. 7-C—W. Central	35		1	14				50		50	34	42	215,130	260	227	+ 14.5	1,233,689	61	50	73
Dist. 8—West	211		1	25				237	9	246	270	268	1,189,762	1,651	1,638	+ 0.8	8,117,608	365	377	472
Dist. 9—North	174			105				279	3	282	259	241	686,298	1,501	1,269	+ 18.3	4,088,940	150	153	110
Dist. 10—Panhandle	55	1	8	3				67		67	95	45	202,262	652	304	+114.5	2,117,908	100	112	157
Utah	4			2				6		6	8	1	31,992	31	13	+138.5	148,515	15	15	12
Virginia															1	−100.0				
Washington															2	−100.0				
West Virginia	8		33	4				45	1	46	35	81	137,591	268	452	− 40.7	786,584	228	224	388
Wyoming	27			25				52	1	53	47	48	219,400	347	257	+ 35.0	1,605,789	95	99	140
Total U.S.	1,806	41	263	1,108	41	10	5	3,274	42	3,316	3,392	3,549	11,680,942	22,073	21,561	+ 2.4	79,287,001	4,016	4,098	5,013

THE PIONEER STILL IS PIONEERING



NEW DEPTH RECORD!

WORLD'S FOREMOST DEEP WELL DRILLER REACHES 20,521 FEET TO BEAT OWN RECORD! For the first time, a well has reached and *passed* the previously "unattainable" depth of 20,000 feet! And for the *third* successive time, The Superior Oil Company has drilled "the world's deepest well".

Pacific Creek No. 1, like the two previous deepest wells shown above, was drilled with machinery and equipment furnished by The National Supply Company. We're proud of that, naturally.

But this first well to reach and exceed 20,000 feet is important far beyond that. It is important because it opens a whole new subterranean frontier tremendously valuable in keeping America's vital oil reserves safely ahead of broadening oil demand.

Six years ago, National Supply engineers visualized drilling equipment that would make possible the opening of that frontier. After the interruption of the war, they resumed their work—and at the Tulsa oil show in 1948, the Ideal Type 160 Consolidated Rig was introduced: the first completely integrated power drilling rig designed to reach 20,000 feet. Draw works, hoisting tackle, diesel engines, pumps, automatic control equipment, and tubular products were predicated on weights and pressures, stresses and strains, encountered at depths never before reached. Together, they combine technical advances never before built into *any* drilling equipment.

Skilled crews of The Superior Oil Company put this new deep drilling rig to its first test under the toughest possible conditions at Pacific Creek No. 1, near Rock Springs, Wyoming. It did the job for which it had been designed: it reached and passed 20,000 feet!

The use of machinery and equipment furnished by The National Supply Company to drill the world's deepest well—and the two previous depth record holders—dramatizes the pioneering role which National Supply has always played in serving the oil industry. It illustrates the *practical pioneering* which has made The National Supply Company a leader in the development, manufacture, and distribution of thousands of products for the oil industry, and for many other industries as well.

THE NATIONAL SUPPLY COMPANY

Executive Offices: Pittsburgh, Pa.

NATIONAL OIL FIELD MACHINERY & EQUIPMENT

SPANG PIPE

SUPERIOR ENGINES

20,000-FOOT "WELL OF TOMORROW"...

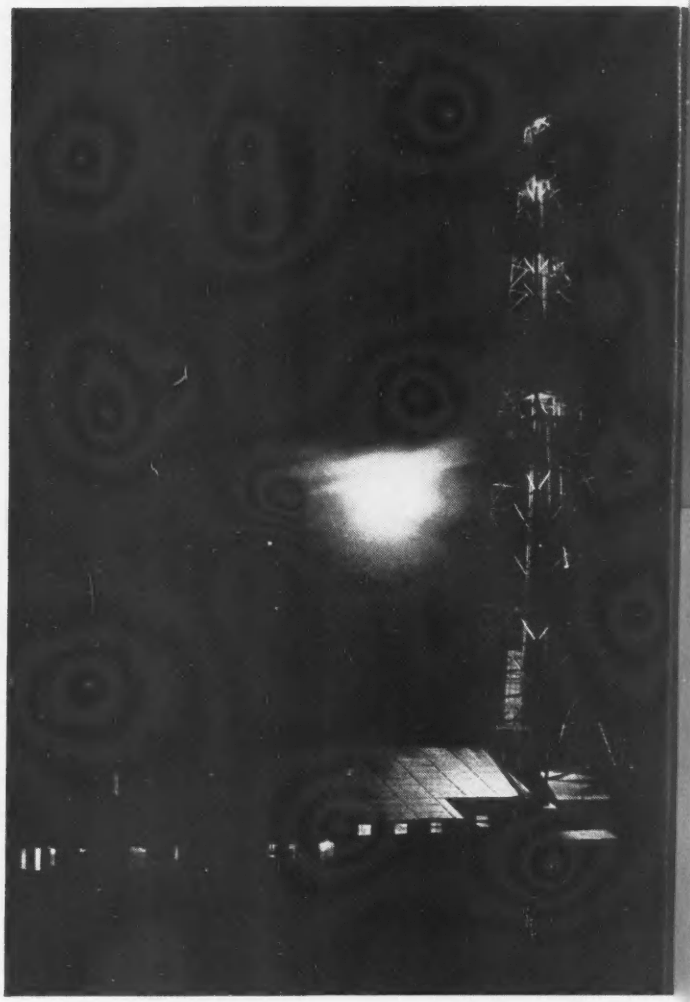
...IT BECOMES REALITY ALMOST YEAR TO A DAY AFTER INTRODUCTION OF NATIONAL SUPPLY'S GIANT IDEAL 160 RIG!

Visitors at the opening day of the Tulsa Oil Show in 1948 crowded around a huge display of machinery and equipment, bright with National Supply's traditional shade of blue. They were interested because it was the largest power drilling rig ever built. They were even more interested because of the claims made for it. An introductory brochure made big claims for the "big rig":

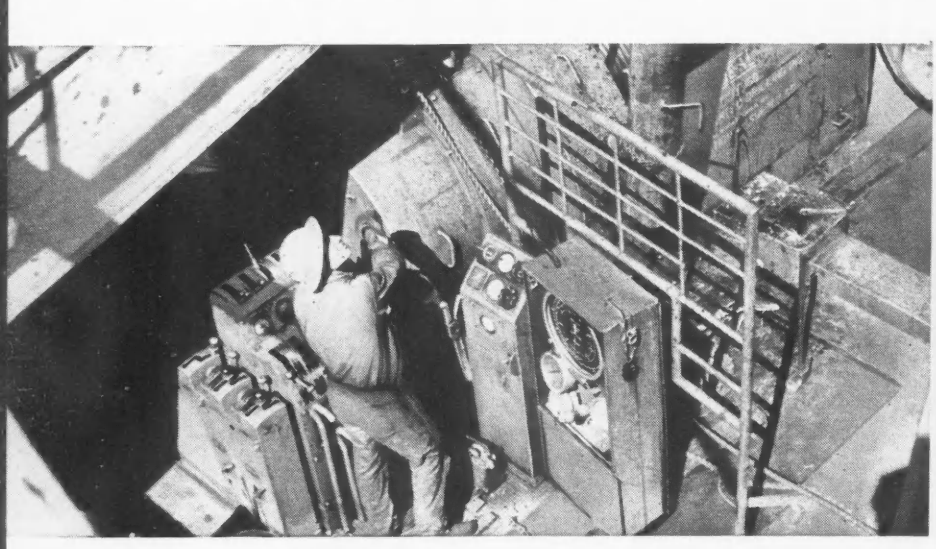
> "The National Supply Company presents . . . a completely modern drilling plant . . . engineered for deep drilling from the supercharged Diesel Engines . . . to the new high-strength casing which completes the well. The basic concept for the design . . . has been predicated on a premise that 400-ton loads corresponding to 40 pounds per foot in a 20,000-foot well may be realized in the foreseeable future."

Almost a year to the day from its first public showing, National Supply's giant new rig had made good. At The Superior Oil Company's well, Pacific Creek Number 1, Rock Springs, Wyoming, it had reached and passed 20,000 feet. But Superior's crews, expert in deep drilling kept the huge 160 rig going until on June 18 it reached a final depth of 20,521 feet, beating Superior's own world's depth record by 1787 feet!

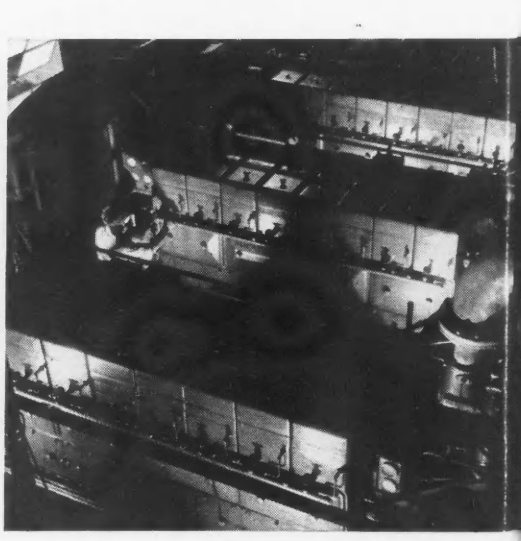
Hard-Headed Dream. The story of the "big rig" is a story of engineers with a dream, a hard-headed dream that came true. The story of The Superior Oil Company's record-breaking Pacific Creek No. 1, a milestone in drilling history, is a story of drilling skill and daring that oil men will tell and retell for many years. Its importance to the future of America's oil reserves is still impossible to calculate.



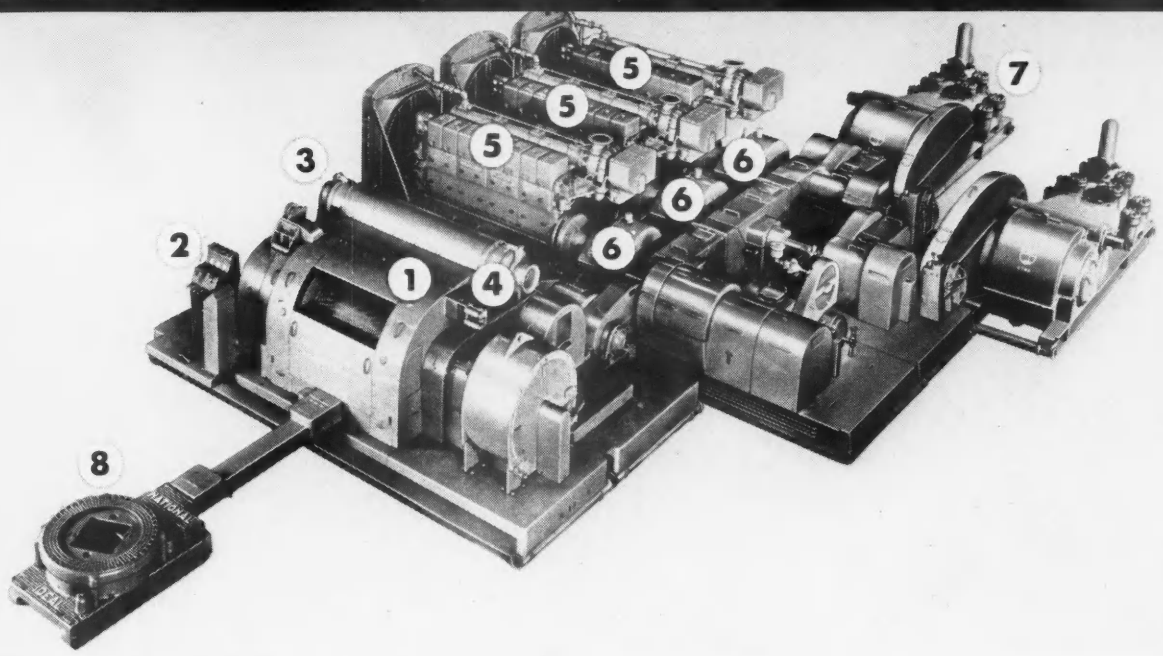
WORLD'S DEEPEST WELL. This dramaitic night scene at Pacific Creek No. 1 highlights the round-the-clock teamwork of Superior's crews and National Supply's huge Ideal 160 rig in drilling 20,521 feet to set a new world's record.



NERVE CENTER. The control panel of the Ideal Type 160 Rig, planned and engineered to give the operator new and greater degree of convenient and positive control over every operation of the giant rig.



3350 HORSEPOWER. Pumps, rotary table, and draw works of Ideal Type 160 rig are powered by three Superior Supercharged Diesels. Two additional Superiors power a third pump.



WORLD'S LARGEST POWER RIG. 1. Draw works, Ideal Type 160 Consolidated Drilling Rig; 2. Control position of National Supply's Ideal 160 rig; 3. Ideal Micromatic Drilling Control; 4. Ideal Type A Universal Cathead; 5. Superior PTDS-8 Supercharged Diesel Drilling Engines; 6. Ideal-Gyrol Fluid Drive; 7. Ideal Type E-700 Duplex Power Pump; 8. Ideal SHS-20½ Shaft Drive Rotary Machine.

"WORK HORSE" OF DEEP DRILLING IS REALLY AN INTEGRATED TEAM

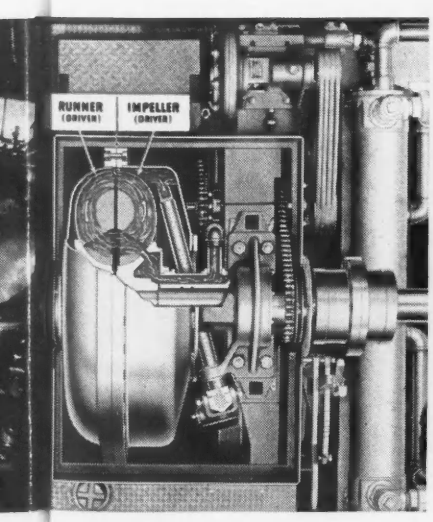
Geologists have long felt that commercially important oil reserves were trapped in the deep earth, 20,000 feet or more below the surface, far deeper than man had ever explored. They dreamed that, some day, equipment would be developed that could cope with the tremendous pressures and weights and temperatures involved in reaching those depths. National Supply engineers shared that dream—and they put it on paper.

Before the war they had gone far in their plans for a new, completely integrated drilling rig, a rig with all its elements—engines, hoisting tackle, draw works, pumps, rotary table, drill pipe, and casing—designed as a smooth-working team that would reach 20,000 feet. It would be the dependable "work horse" of deep drilling.

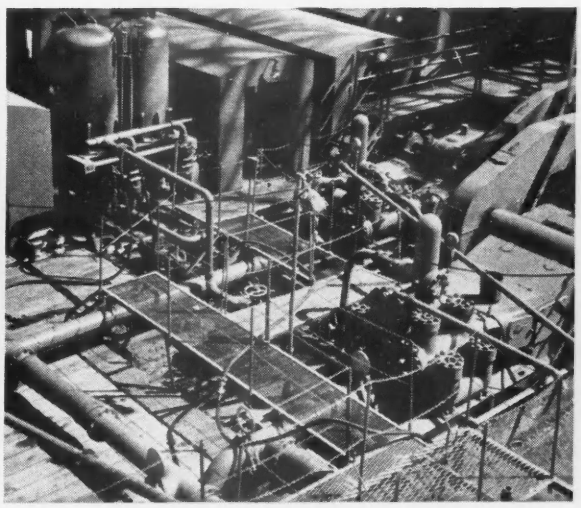
These plans were shelved during World War II. After the war (which served to highlight America's need for self-sufficiency in oil), work on the big rig went forward again. The problems were enormous. They ranged from power to handle 400-ton casing strings to automatic controls that would handle the delicate matter of weight on a drilling bit almost 4 miles down.

National Supply's Ideal Type 160 Consolidated Drilling Rig was first shown to the industry at Tulsa Oil Show last year. It was bought by The Superior Oil Company, identified as a leader in deep drilling, and holder of two consecutive depth records (Weller No. 1, Ft. Cobb, Okla., 17,823 ft., and Limoneira No. 1, Ventura, Calif., 18,734 ft.)

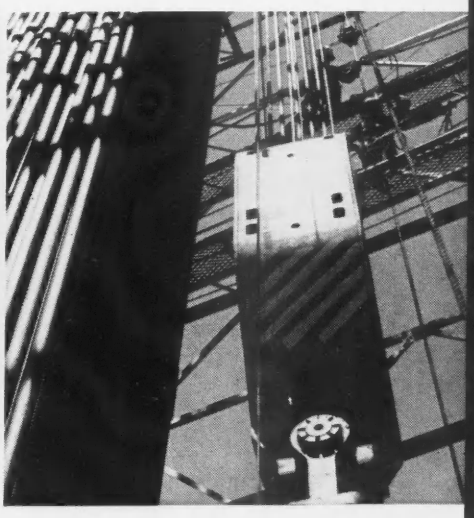
Odds Were Great. The spot picked for the "big rig's" first test was near Rock Springs, in southwestern Wyoming, where conditions below ground are among the most difficult in the United States for drilling. Nature stepped in to present the worst possible conditions above ground. The winter at Rock Springs was the most severe ever recorded there. For weeks at a time, the temperature seldom got above zero in the daytime, and dropped to 35 or 40 degrees *below* every night. Snow fell so fast and so long that a snow plow and a bulldozer were busy night and day keeping clear the long road from the well to town.



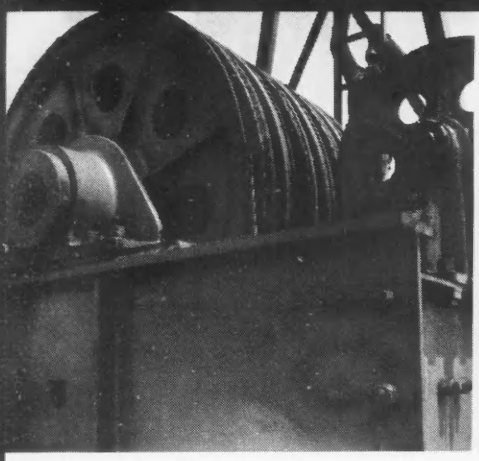
LVET HARNESS. Tremendous power
l speed of the diesels are transmitted
ugh exclusive Ideal-Gyrol Fluid Drive,
"velvet harness" that provides smooth,
rate, positive control.



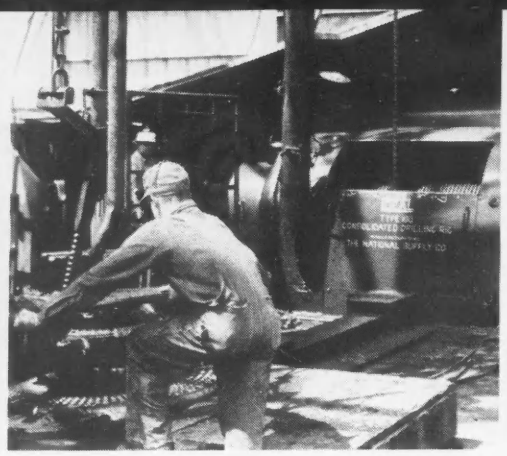
PUMPS. One of the E-700 drilling pumps and the C-350 mud-mixing pump are shown here. Upper left in picture are two surge tanks, part of the National Supply-developed system for compounding pumps.



SIX-SHEAVE 540-TON TRAVELING BLOCK. Designed especially for the 160 rig, the new Ideal Type 660-TD Traveling Block pictured above weighs 11 tons, has rated capacity of 540 tons.



SEVEN-SHEAVE 630-TON CROWN BLOCK. The big rig's crown block is rated at 630 tons. When strung with 1½″ wire line, the crown and traveling block of the Ideal 160 rig constitute the heaviest hoisting equipment ever built.



ROTARY TABLE is driven independently of the main draw works shafts through a separate transmission. Drive shaft replaces conventional chain drive on rotary table.

300 TONS HUNG BY A THREAD. Spang Extreme Line passed the toughest test ever given any casing when 19,765 feet of 7-inch (7½ carloads) were set at Pacific Creek No. 1. Inset shows exclusive Extreme Line joint.

"WORK HORSE" OF DEEP DRILLING *(Continued)*

But the "big rig" kept right on working night and day—undisturbed by the worst that Nature could throw its way—to set both a new world's depth record and a new standard for dependable performance.

The history-making rig at this history-making well is powered by three Superior Supercharged Diesel Drilling Engines with Ideal-Gyrol Fluid Drive. Combined horsepower: 2010, which can be delivered to the two pumps (Ideal E-700 and Ideal C-350), and at the same time drive the rotary table. When hoisting, the entire power can be delivered to the draw works. A third pump, an E-700, is driven by two additional diesels like the other three.

The crown block (rated at 630 tons) and the traveling block (540-ton rating) are strung with a 1½″ wire line to form the heaviest hoisting equipment ever built for any purpose.

Controlling the weight on a bit that's at the bottom of a 20,000-foot hole is a delicate job. An unusual feature of this giant rig is the Ideal Micromatic Drilling Control, developed to aid the driller in maintaining the desired weight on the bit. Instead of relying on "feel", he watches a feedometer that indicates penetration in feet per hour, and merely manipulates a valve. Feed is automatically cut off when rotation is stopped.

This world's deepest well was drilled and cased completely with Spang tubular products.

Grade E Drill Pipe of 4½-inch diameter was used inside the 9⅝-inch casing to 19,765 feet. The 3½-inch drill pipe used inside the 7-inch casing, to bottom, was a special high strength SAE 4340 grade.

The casing string at Pacific Creek No. 1, the longest ever set, is made up entirely of Spang Extreme Line, Grade 4340 (19,765 feet of 7″ O.D. run inside of 10,000 feet of 9⅝″.) The 19,765 feet of 7″ casing, weighing 594,000 pounds, was perfectly free while running and provides dramatic proof of Extreme Line casing's ability to resist pull-out.

Frontier of Depth. The complete significance of the geological findings at Pacific Creek No. 1 are not yet fully known. Petroleum Engineers and geologists agree that depth is the newest frontier in expanding the world's oil reserves. National Supply's Ideal 160 rig makes such exploration possible for the first time, and provides the maximum in dependability for deep wells under that depth.

FOR SETTING RECORD LENGTH STRING Type S, Ideal Automatic Grip Elevator (and spider), w especially designed for fast, safe setting of long strin such as the 19,765 feet at the world's deepest w

THE NATIONAL SUPPLY COMPAN

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★ *THE INDUSTRY'S MOST COMPLETE LINE OF OIL FIELD EQUIPMENT*

Looking Ahead

SUBSTANTIALLY HIGHER crude production and refinery runs are expected to be required later this year and early next year, when fuel and heating oils will be heavily used.

HEATING OIL CONSUMERS are being warned that delay in filling their tanks may cause congestion in transportation and distribution later in year and force prices higher.

GENERAL BUSINESS conditions have greatly affected oil industry and will continue to do so. It is encouraging, therefore, that there are now increasing indications of leveling-out or pickup in various lines of business. Oil industry has maintained satisfactory condition through adjustments of production and prices and is in good position to benefit from any improvement in general business situation.

IMPORTANT REASONS are given why business decline should not be drastic. Lacking are speculative excesses in inventories and stock market as in 1920, 1929, and 1937. Readjustments in production, prices, and inventories have not been sudden and simultaneous for all industries but piecemeal and gradual, softening effects. Government construction, farm price supports, and federal deficit are expected to cushion decline. Living off inventories cannot last indefinitely.

IF BUSINESS improvement is not in sight by end of year, President Truman is expected to call on Congress when it reconvenes, asking vigorous federal program to stimulate employment.

AT LEAST FOUR more years of good business are expected by automobile industry. That much time will be needed to replace most of the 10 to 12 million prewar cars with postwar models.

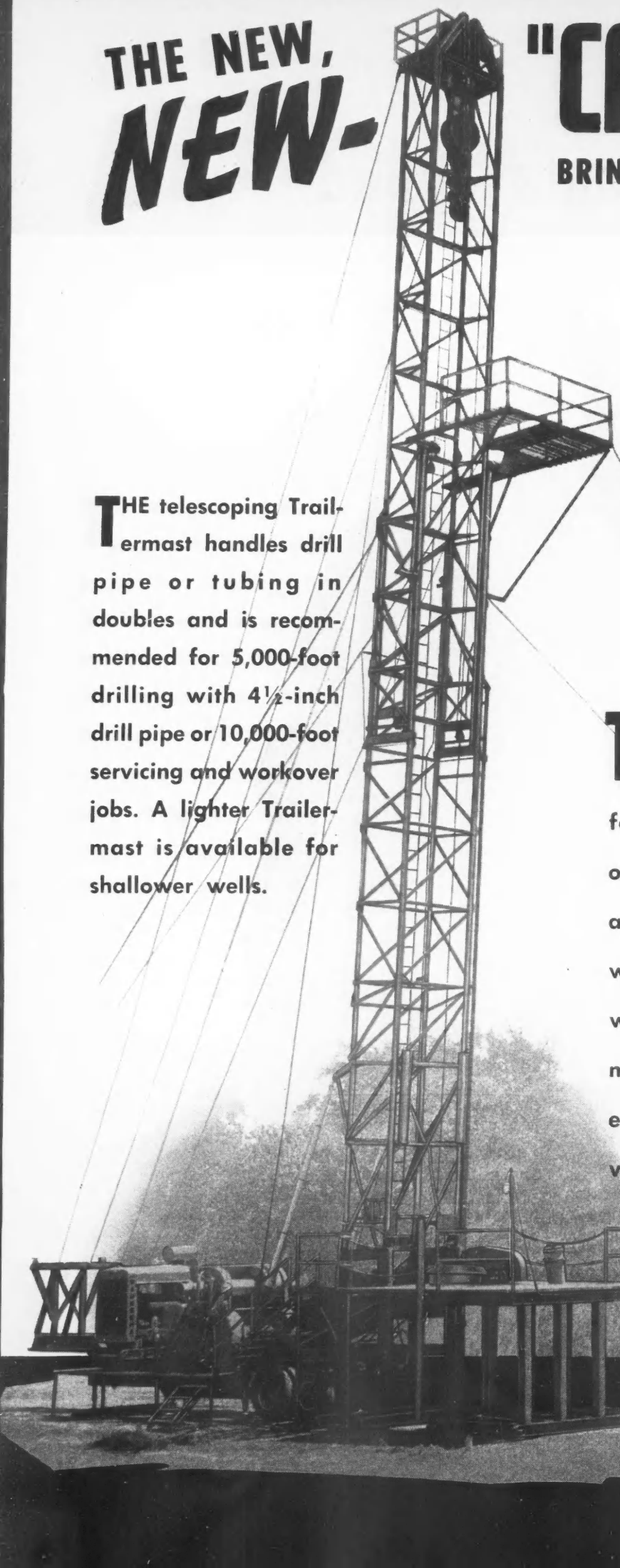
WITH 50 MILLION motor vehicles expected on U. S. highways by 1953, gasoline and lubricant consumption will continue to expand. This would be 21½ percent more vehicles than were used in 1948. Markets are being expanded also in farming and aviation.

GREATLY INCREASED use of natural gas for industrial processes is promised. Recent years have brought significant advancement in technologies of applying gas to industrial processes. Continuing research programs and cooperative efforts of large production industries and equipment manufacturers will further enhance usefulness and consumption of gas.

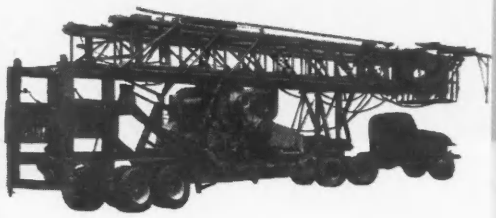
FUTURE ULTRA-DEEP DRILLING can profit from experience of The Superior Oil Company in drilling Wyoming wildcat to new world record depth of 20,521 feet. Story of this pioneering job, scheduled for WORLD OIL'S October issue, credits well with use of world's largest drilling equipment, first setting of depth record with diesel power, first use of 1½ inch wire line on a rig, running of casing to 19,765 feet, continuance of drilling through one of Wyoming's worst winters.

THE NEW, NEW- "CARDWELL

BRINGS MAXIMUM PORTABILITY A



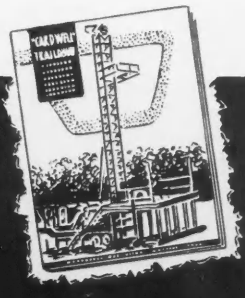
The Trailermast with draw works in place is quickly moved as a single unit by a fifth-wheel truck tractor.



THE telescoping Trailermast handles drill pipe or tubing in doubles and is recommended for 5,000-foot drilling with 4½-inch drill pipe or 10,000-foot servicing and workover jobs. A lighter Trailermast is available for shallower wells.

THE Trailermast assembly is only 8 feet wide in roading position with overall heights as low as 13'-6". Any appropriate size single engine draw works or servicing hoist can be used without modification on the Trailermast. The draw works or hoist can be easily removed for use under a conventional derrick.

WRITE FOR OUR NEW TRAILERMAST CATALOG

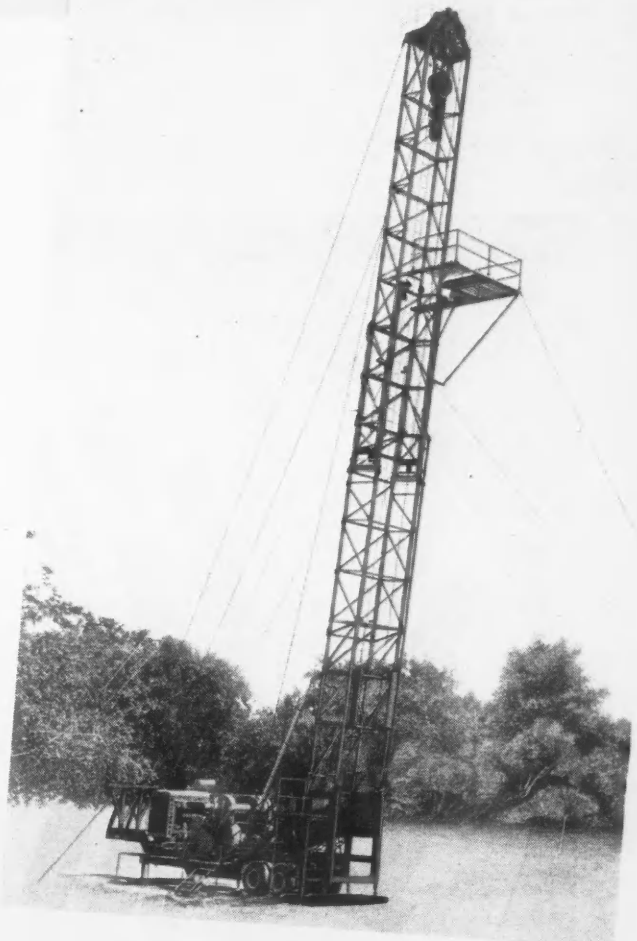


TRAILERMAST . . .

TY AND RIG UP SPEED TO OLD OR NEW "CARDWELL" SINGLE ENGINE RIGS

ADDING this new Trailermast to your "Cardwell" single engine rig means you can move in and rig up faster than any competitor with other portable equipment.

The 16' x 16' platform provides plenty of working space. Platform is high enough to provide room for blowout preventers and wellhead connections and is accessible from either side. Built-in rathole digger is provided.



For servicing jobs, the rotary table platform and substructure can be deleted, making the Trailermast a fast moving, lightweight servicing rig.

"Cardwell's" reputation in all fields for building "Tough Iron" comes from the use of Alloy steels and heat-treatment. This "know how" cannot be copied.

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Drilling Costs Level Off But *Total Revenue* Declines

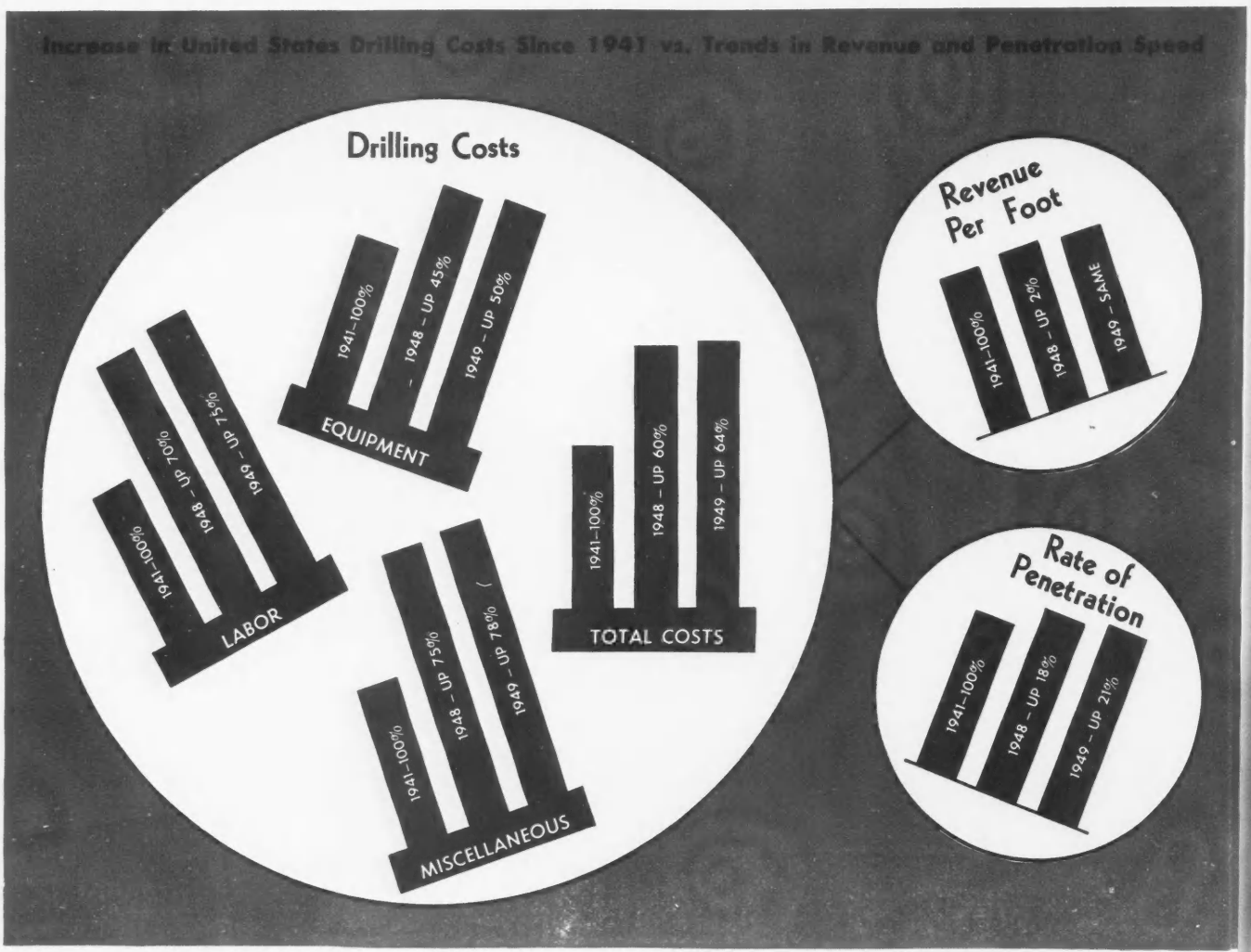
By WARREN L. BAKER, Editor

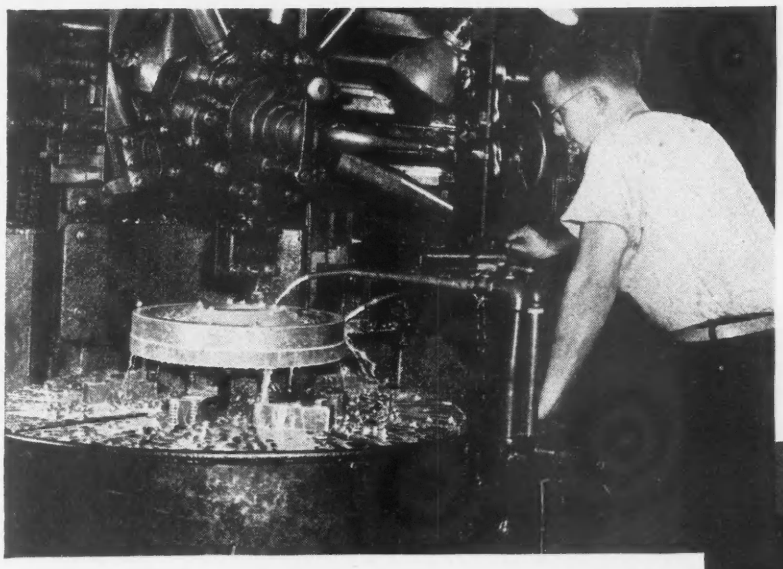
AS IN the preceding four years, prices for rotary contract drilling failed to keep pace with rising costs during the past 12 months. Although the upward trend of costs recently has shown a tendency to flatten out, and therefore expenses currently are not much higher than a year ago, the economic position of rotary drilling contractors has deteriorated instead of improved because both revenue rates and drilling volumes have declined from year-ago levels. Consequently, contractors today must meet greatly enlarged expenses while receiving the same rate of income they did in 1941.

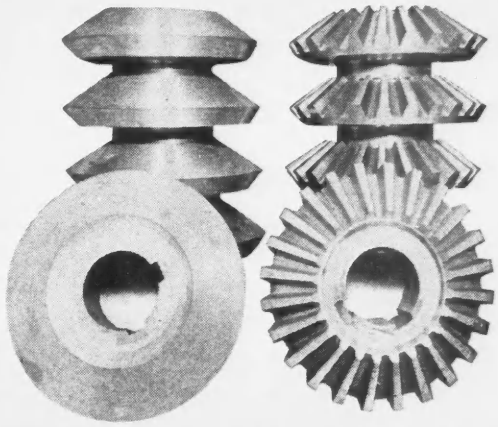
For the U. S. as a whole, a third annual study by WORLD OIL reflects that total or over-all drilling costs for rotary rigs now are 64 percent greater than in 1941. This represents a 4 percent increase in costs during the past year, and a 19 percent gain over 1947 levels. This means that while it costs $500 per day to operate a medium rig in 1941, it now costs around $800 daily. A heavy-duty rig which cost $700 per day to operate in 1941 now costs around $1150 per day.

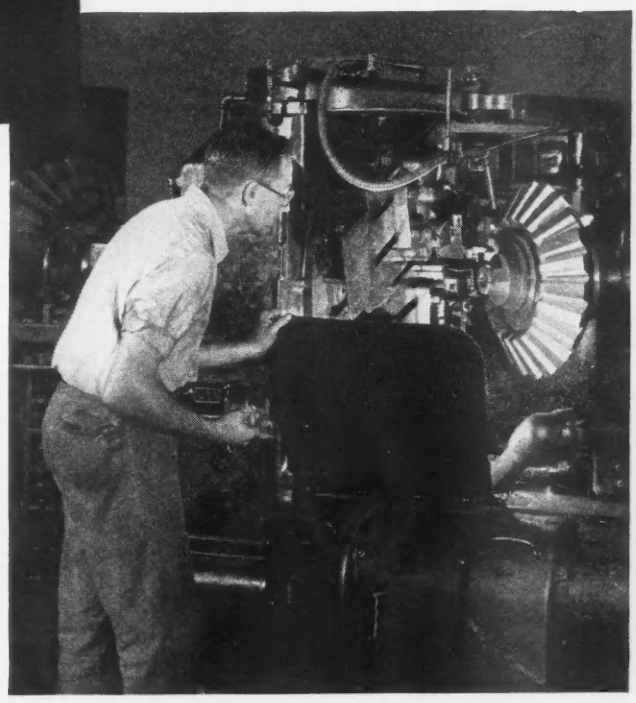
In contrast to these gains in costs the average revenue per foot of hole drilled which contractors currently receive for rotary drilling is exactly the same as in 1941, having decreased 2 percent since 1948 and 1 percent since 1947. Hence, with a 2 percent loss in revenue per foot and a 4 percent gain in costs in the past year, drilling contractors are in a worse economic position than the very unfavorable situation of 12 months ago. A number of contractors feel that the cost figures presented in this study are too conservative, and that current expenses are considerably higher—perhaps by 5 to 10 percent.

Only to a limited extent have contractors been able to offset the growing deficit between costs and income by increased operating efficiency. The average rate of penetration (speed of making hole) in the U. S. today averages about 21 percent faster than in 1941. It









FORMULA FOR A

GOOD GEAR BLANK

At Bethlehem, the formula goes something like this: GOOD steel, GOOD processing, GOOD machining . . . plus closest metallurgical controls through the critical steps of manufacture.

This combination, topped off by rigid inspection service, means high-quality gear blanks. The steel for these blanks is drawn from selected heats; upsetting, forging, and rolling are done in a three-way mill that combines these operations, imparting homogeneity and good grain structure. Each piece is given a rough machining before it leaves our plant—a step that saves time and expense for the customer.

If you make spur, herringbone, bevel, or miter gears, we suggest you thoroughly investigate Bethlehem blanks. They have so many excellent features; for instance, their high strength frequently makes possible thinner sections, thus affording savings in weight. They are available in carbon or alloy steel, treated or untreated; sizes range from approximately 10 in. to 42 in. OD.

Gears are but one of the many types of products that can be made from these rolled-and-forged circular blanks. For more information, request illustrated Booklet 216. We'll be glad to send you a copy free.

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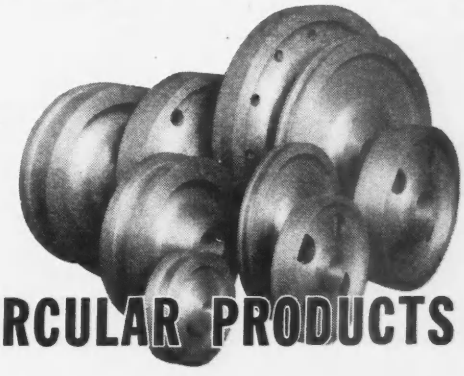
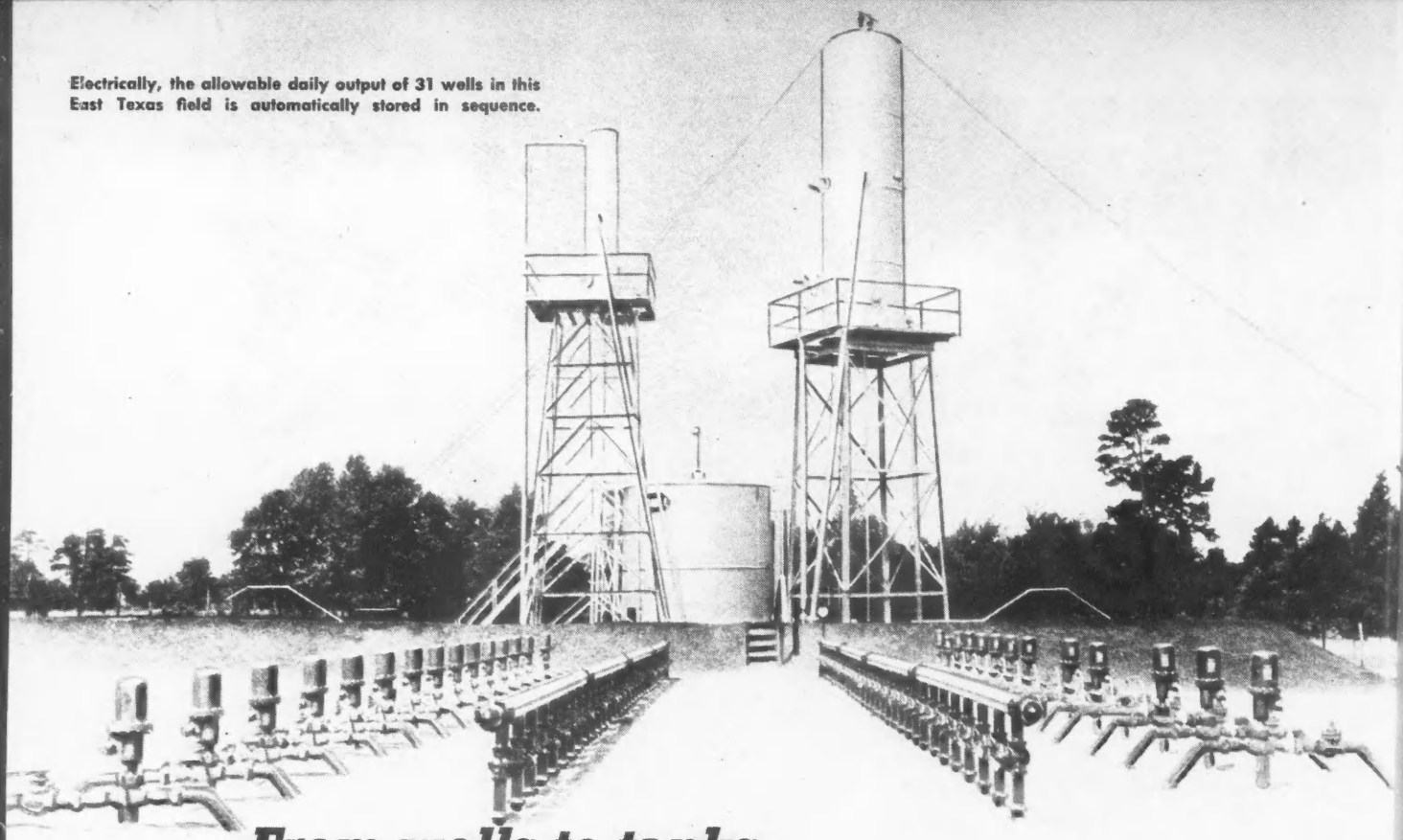


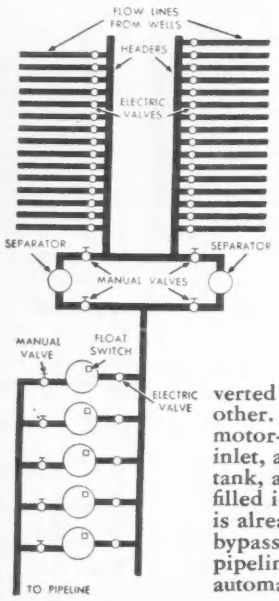
BETHLEHEM ROLLED-AND-FORGED CIRCULAR PRODUCTS



Electrically, the allowable daily output of 31 wells in this East Texas field is automatically stored in sequence.

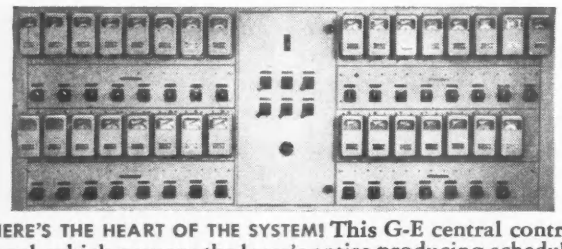
From wells to tanks– AUTOMATICALLY !

Another example of General Electric oil field electrification!



THIS IS THE WAY IT WORKS!

As this schematic layout shows, all well lines are opened and closed by motor-driven hydraulic valves, actuated by time switches. Any well can also be flowed by a manual valve in parallel with automatic valve. After passing through headers and separators, well flow is automatically diverted from one storage tank to another. This is done by means of a motor-operated valve in each tank inlet, a special float switch atop each tank, and a control panel. Tanks are filled in sequence, with any tank that is already filled or on pipeline being bypassed. If all tanks are full or on pipeline, the system shuts itself off automatically.



HERE'S THE HEART OF THE SYSTEM! This G-E central control panel, which governs the lease's entire producing schedule, contains master switch, manual tank-valve switches, and sequence selector. Flanking it are 31 G-E time switches and manual switches for all wells. Ample room at the bank of the panel makes for easy inspection and repair.

Here is just one of many illustrations of the savings that electrification can bring to oil production. In the case of this East Texas oil field, an electrically-controlled system utilizing General Electric control throughout now makes possible *automatic* control of the allowable production of 31 flowing oil wells and a battery of five storage tanks!

By eliminating manual operations, this electrified system reduces necessary walking to and from wells, since it requires little or no attention by the operator. This frees the operator for other duties, helps cut lease operation costs.

HOW CAN *YOU* CUT COSTS—ELECTRICALLY?

Whether your job is drilling, well pumping, or pipe-line pumping, there are plenty of ways in which electrification can help you do it more efficiently, more economically. They're described in Bulletin GES-3485, "More Oil at Less Cost—Electrically." Send for your copy today.

A MOVIE WORTH SEEING!

It's "Lease on the Future", a motion picture on oil field electrification, in full color and sound. Ask your nearest G-E office about having it shown to your organization.

More Power to America

Apparatus Dept., General Electric Company, Schenectady 5, N. Y.

GENERAL ELECTRIC

661-6

Trends In Drilling Costs and Revenue

(1949, 1948 and 1947 compared with 1941 level)

UNITED STATES

	1941	1947	1948	1949
Drilling Costs:				
Labor Costs	100%	150%	170%	175%
Equipment Costs	100%	132%	145%	150%
Miscellaneous Expenses	100%	160%	175%	178%
Total Drilling Costs	100%	145%	160%	164%
Revenue per Foot Drilled	100%	99%	102%	100%
Rate of Penetration	100%	115%	118%	121%

PERMIAN BASIN

	1941	1947	1948	1949
Drilling Costs:				
Labor Costs	100%	155%	170%	175%
Equipment Costs	100%	133%	146%	150%
Miscellaneous Expenses	100%	165%	177%	178%
Total Drilling Costs	100%	150%	161%	164%
Revenue per Foot Drilled	100%	98%	103%	100%
Rate of Penetration	100%	125%	125%	125%

TEXAS-LOUISIANA GULF COAST

	1941	1947	1948	1949
Drilling Costs:				
Labor Costs	100%	150%	170%	175%
Equipment Costs	100%	133%	145%	149%
Miscellaneous Expenses	100%	164%	174%	176%
Total Drilling Costs	100%	145%	160%	163%
Revenue per Foot Drilled	100%	102%	103%	101%
Rate of Penetration	100%	118%	118%	119%

OKLAHOMA-KANSAS

	1941	1947	1948	1949
Drilling Costs:				
Labor Costs	100%	145%	165%	170%
Equipment Costs	100%	132%	144%	148%
Miscellaneous Expenses	100%	160%	170%	174%
Total Drilling Costs	100%	145%	155%	160%
Revenue per Foot Drilled	100%	99%	101%	99%
Rate of Penetration	100%	118%	118%	120%

CALIFORNIA

	1941	1947	1948	1949
Drilling Costs:				
Labor Costs	100%	155%	171%	177%
Equipment Costs	100%	135%	146%	151%
Miscellaneous Expenses	100%	165%	180%	180%
Total Drilling Costs	100%	150%	165%	169%
Revenue per Foot Drilled	100%	98%	101%	100%
Rate of Penetration	100%	115%	117%	120%

was only 18 percent better in 1948 and 15 percent higher in 1947.

Chances of an improvement in the relationship of costs and prices are not at all favorable. Decreased drilling activity has increased the number of idle rigs. Approximately 2000 rotary rigs now are running in the U. S. and Canada, compared with 2300 a year ago. In addition to approximately 500 stacked rotary rigs, there are about 500 rigs which are temporarily idle in the U. S. at present, as contrasted with only 300 idle rigs a year ago. A part of a contractor's overhead expense continues even when a rig stands idle. Large contracting organizations must maintain adequate supply lines, transportation facilities and shop equipment. For this reason some contractors have been willing to take jobs at low rates in order to keep rigs and crews working. In time these low prices will inevitably set the rate for future work, so the fact that a large number of surplus rigs exists does not imply hope for higher drilling prices.

Major factors in the upward trend of drilling costs are: (1) higher costs of wages, equipment and operating expenses; (2) greater depth of wells; and (3) the larger proportion of exploratory or wildcat wells being drilled.

Labor costs on rotary rigs, which account for approximately one-third of the expense of drilling a well, are up 75 percent in 1949 from the 1941 level for the nation as a whole. This represents an increase of 5 percent over 1948 rates, and a 25 percent gain since 1947. Individual wages are not up 75 percent since 1941, but it is a general practice now, for example, to pay crews during cementing and other operations.

Equipment costs today have advanced 50 percent above those of 1941. This represents a 5 percent increase over 1948 and 18 percent above 1947. This is an important factor, since equipment accounts for about 45 percent of all contracting expenditures. With 500 rotary rigs stacked, contractors have been able to offset some of the increase in equipment costs by using parts of these rigs instead of purchasing new equipment. This means that contractors are liquidating their physical assets into cash, and at some future time must make heavy purchases or find themselves operating with obsolete and worn-out equipment.

In contrast with 1941 levels, miscellaneous drilling expenses (trucking, insurance, etc.) today are 78 percent higher than in 1941. This represents a 3 percent gain the past year and an 18 percent growth compared with 1947.

Gains in drilling costs vary somewhat in the different important rotary drilling areas of the U. S., but all are following the same general trends indicated by national averages. Total costs in Oklahoma-Kansas are at present but 60 percent greater than in 1941, the Texas-Louisiana Gulf Coast is up 63 percent, the Permian Basin 64 percent, with California showing a 69 percent growth. Data by principal regions, as well as for the nation as a whole, are presented in accompanying tables.

Increased depth of wells is a factor contributing to higher drilling costs. Despite improved equipment and faster penetration rates, it still costs two and perhaps three times as much to drill a 10,000-foot hole as a 7000-foot well, and beyond 10,000 feet costs increase rapidly. The sharp increase in time required is the biggest single factor which causes costs for deep drilling to soar.

Some of the increased costs being experienced by contractors are due to the greater number of wildcat wells being drilled. Wildcat wells cost much more than field development wells, due to the greater amount of coring and survey work required, and because of the caution necessary when little is known about formations to be penetrated. During the first half of 1949 and 1948, over 17 percent of all the wells completed were exploratory wells, while only 10 percent were wildcats during the year 1941.

It is very important that contractors study their costs and recognize certain hazards that are always present. If contractors could and would realize that it is impossible to keep every rig busy all the time, they probably would be more prosperous and keep themselves out of some of the financial losses they experience.

Stocks Below Prewar Levels

On Basis of Days' Supply

By L. J. LOGAN
Associate Editor

ALTHOUGH this year has brought concern over "excessive" stocks of crude oil and the principal refined products, inventories actually have been and still are quite moderate in relation to prevailing demand. They represent fewer days' supply than were normally carried before the U. S. entered the war.

It is true that present stocks represent more days' supply than were held during the war and for the first few years after the war, including 1947 and 1948. But those were years of rationing, scarcity, or threatened scarcity and cannot be used as standards for normal times. If stocks were now at those wartime and postwar low levels in terms of days' supply, there would still be difficulty in supplying the consumers.

Data for the five years prior to U. S. entry in the war, 1937-1941, are here presented in tabular form to show normal peacetime levels of stocks. The figures show that the industry in that period consistently carried more days' supply of crude and products than have been carried this year.

Apparently, the industry has been thinking of the proper and adequate levels of stocks too much on the basis of those carried in the war and early postwar periods and not enough on the basis of what was found practical in the normal years before the war.

If stocks as measured in terms of days' supply were back to prewar levels, there would be now substantially larger inventories of crude oil, gasoline, and residual fuel oil, while stocks of distillate fuel oil would not be materially different from what they actually are. Therefore, the stocks of all oils would be materially greater than they are.

Slow Improvement

U. S. stocks of crude petroleum are quite low in relation to prevailing requirements, representing only a few more days' supply than in the wartime and early postwar years, when there were some difficulties in keeping refineries fully supplied. Crude stocks at mid-year 1949 were equivalent to 50 days' supply on the basis of daily average demand in the first half of the year. Midyear stocks had been equal to 45 days' supply in 1945, 47 days' in 1946 and 1947, and 40 days' in 1948. In the five years, 1937-1941, crude stocks had come down from 93 to 70 days' supply, and during the war they were further reduced in amount and days' supply.

Crude stocks at mid-1949 totaled about 274 million barrels, or 50 days' supply, and at the end of July, 1949, they were down to 272 million. It is generally conceded in the industry that this is not an excessive level for crude stocks. At the March, 1949, statewide hearing of the Texas Railroad Commission in Houston, economists and executives of numerous large oil companies estimated the desirable level for crude stocks within a range of 250 to 275 million barrels, equivalent to 46 to 50 days' supply. In the summer of 1939 a crude price cut was attributed to surplus crude production and high stocks, which totaled about 285 million barrels, or 76 days' supply; and most states of the Southwest ordered temporary shutdowns of production for several weeks. Then the Texas Railroad Commission held a hearing and sought estimates of the proper level for crude stocks at that time. Representatives of large companies variously made estimates of 205 to 260 million barrels, equivalent to 55 to 70 days' supply, and the average of the estimates was 230 million barrels, equal to 61 days' supply. The present stocks of 50 days' supply are lower than the lowest of those prewar estimates of proper stocks.

At the hearings mentioned above, estimates were offered also on the desirable levels for gasoline stocks, and according to those estimates, gasoline stocks this year have followed a satisfactory trend. On April 1 of this year stocks of finished and unfinished gasoline totaled about 128 million barrels or 51 days' supply at the March rate of demand, and estimates at that time of desirable stocks ranged from 120 to 128 million barrels, or 48 to 51 days' supply. In the 1939 hearing it was variously estimated that stocks the following April 1 should be between 70 and 86 million barrels or 46 to 57 days' supply, with estimates averaging out to 78 million barrels or 52 days' supply. In prewar years, April 1 stocks of motor fuel equalled 57 to 67 days' supply and in recent years they were slightly under 50 days' supply. For October 1, 1949, the hearing last spring indicated gasoline stocks of 85 to 95 million barrels, or 31 to 34 days' supply as desirable, with estimates averaging 90 million barrels or 32 days' supply. For October 1, 1939, the hearing of that year suggested stocks of 55 to 67 million barrels, or 31 to 37 days' supply, with

■ CONTINUED ON PAGE 4

U. S. Stocks of All Oils, Crude, and Principal Products at Midyear 1949 Lower than Before U. S. Entered War, on Days' Supply Basis

Stocks as of June 30 each year; day's supply on basis of daily average demand during first half of year. Data include stocks at refineries, at bulk terminals, in transit and in pipe lines.

YEAR	All Oils		Crude Oil		Motor Fuel		Distillate Fuel Oil		Residual Fuel Oil	
	Thous. Bbls.	Days' Supply	Thous. Bbls.	Days' Supply	Thous. Bbls.	Days' Supply	Thous. Bbls.	Days' Supply	Thous. Bbls.	Days' Supply
Prewar:										
1937	550,685	156	308,788	93	73,866	51	*20,657	*53	*81,224	*85
1938	583,507	166	310,059	90	80,676	54	*24,699	*63	*95,690	*115
1939	556,559	149	287,521	81	81,144	52	31,877	70	98,405	107
1940	566,210	145	275,305	73	93,276	58	33,585	62	91,148	95
1941	551,870	131	270,406	70	88,646	50	38,274	69	79,948	74
Final War Year:										
1945	449,174	81	223,262	45	78,812	36	32,440	43	35,606	23
Postwar:										
1946	479,955	91	228,061	47	91,069	44	38,824	49	41,492	30
1947	496,661	86	242,707	47	86,612	39	39,676	43	43,515	30
1948	523,906	85	231,412	40	102,298	43	†48,352	45	†52,465	35
							‡45,835	43	‡44,213	30
1949	635,781	106	274,256	50	114,048	45	64,148	67	65,857	47

* Refinery stocks only; bulk terminal stocks not included.
† Old basis, for comparison with prior years.
‡ New basis, for comparison with 1949; does not include cracking stocks in California, as previously.

The Employer Unit Plan

Roughneck Joe Becomes a Partner

By AL REESE
Managing Editor

ROUGHNECK JOE has become a "partner" in an oil well drilling contracting firm.

No longer does Joe toil at the lower end of a one-way street, taking orders with no say-so and perhaps little interest in company affairs.

It's a two-way street now, and Joe's voice is heard—and heeded—by Management.

That is the experiment being conducted in the Permian Basin by the Carl B. King, W. H. Black, J. F. Postelle and M. J. Delaney drilling companies under the auspices of the American Association of Oilwell Drilling Contractors and with the cooperation of the Industrial and Business Training Bureau, a division of the Extension department, The University of Texas.

The Texas Employers Insurance Association and Employers Mutual Insurance Company of Wassau contributed generously to make the program possible. Their grants to the AAODC were made with the request that the money be earmarked for reducing accidents in the field.

This, the Employer Unit Plan, is labeled an experiment; but it is such only in its application to the personnel problems of the drilling contractor.

Its aims of creating a free interflow of ideas between management and employe and of allowing decisions at the lowest competent level are not new to the oil industry, which has long held safety meetings, foremen's meetings and supervisors' meetings under well-defined policies of industrial relations.

An almost universal weakness of these programs, however, has been their inability to include drillers and roughnecks, who unlike production, pipe line and geophysical workers, are tied to their jobs.

Management could confer, yes, and the toolpushers could be called together, but how to get across the message of safety and efficiency, of loyalty and responsibility, to the men far afield—the men, heart and soul of the drilling contracting industry, who needed these lessons most of all?

The answer, as the Employer Unit Plan may prove, is this: Since the men cannot come to the conferences, then take the conferences to the men.

The next step was to evolve a program good enough, and applied by leaders expert enough, to put across the contractors' aims to the drillers and roughnecks — those far-scattered little teams who too often figure it is their only responsibility to make hole, their only privilege to cash pay checks, and their only loyalty to themselves.

James R. D. Eddy, director of the Industrial and Business Training Bureau, and John Woodruff, head of the Petroleum Section, were consulted and the task of installing the Plan was assigned to Forrest Smith, a prewar toolpusher for Don Crosby Drilling Company, a wartime lieutenant colonel in the 90th Division, and a postwar training officer for the Organized Reserves, State of Texas.

Smith has since been joined by Vernon V. Bruce, formerly with Magnolia Petroleum Company and later a consultant, who has taken over the conferences for the Postelle, Delaney and Black companies.

Plan's Purposes

The Plan got under way March 1 with these general purposes:

1. Introduce conferences on company personnel policies and operational procedures.

2. Give supervisors an understanding of the importance of such policies in the promotion of employe good will and efficient conduct of the organization.

3. Ensure that supervisors will know what the company organization and policies are.

4. Ensure that uniform interpretation will be given to such policies.

5. Obtain the opinions and attitudes of the supervisors on existing personnel and operational procedure problems and their suggestions for modifications.

6. Develop that supervisors are executives and an integral part of management.

7. Define the job of supervisory management.

8. Help supervisors determine functions they must perform in their jobs.

9. Keep management informed and advised as to training program progress so that the program may be coordinated.

The toolpushers in each company meet once a month and have now had five sessions. On a schedule of two meetings per month for drillers and roughnecks, two have been held at each rig, beginning July 1.

The first rig meetings familiarized the men with the Plan. They were given to understand that their company's purpose was to share information among roughnecks, drillers, toolpushers and management. They were assured of their company's interest in them, invited to reciprocate with constructive criticism and suggestions as to methods and equipment.

At subsequent conferences they were invited to talk about anything they chose that pertained to their jobs. The topics happened to be inspection, handling, and maintenance of equipment (tongs, tubing, cathead and catline, etc.).

Depending on the problems of the individual company and the level of the men involved, the subjects to be discussed in the future will fall within the following broad outline:

1. Organizational structure.
   - A. Establishing lines of responsibility.
   - B. Determining duties and responsibilities of each level of supervision.

2. Personnel policy (individuals).
   A. Determine policy and practice the following:
      1. Selection and hiring of men.
      2. Inducting and breaking in a new man.
      3. Cost control.
      4. Promotion (development of old men).
      5. Vacations.
      6. Repairs—shop work.
      7. Stacking rig—seniority—bumping men.
      8. Organization.
      9. Safe practices—rules.
      10. Medical attention — facilities — accident reports.
      11. Benefits.
      12. Compensation insurance procedures.
3. Operating procedure (crew or units).
   A. Inspection and care of equipment.
   B. Housekeeping.
   C. Purchase, use and storage of materials (item needed, cost responsibility, where to store).
   D. Directions — instructions — techniques of leading discussions.

(A similar training program is being conducted by Smith with 36 supervisors of Gulf Oil Corporation in the Odessa area. Subjects that will stress the techniques of conference leadership are selected for discussion.)

Smith, a training specialist who knows roughnecks as only an ex-roughneck can, is confident of the eventual success of the Plan while warning that results which can be put in a ledger will be slow coming.

"Our job is to break down three walls —the one around management, the one around the toolpushers, and the one around the drillers and roughnecks. Then we will have a free flow of information and ideas."

J. E. Warren, president of the Carl B. King Drilling Company of Midland, was a stout advocate for introducing the Plan and is cautiously enthusiastic about its success. He believes it will help the drilling contractors in two paramount ways: Increased safety and reduced labor turnover.

He says that a big expense on every drilling contractor's books is accidents. Reduce accidents and you lower medical and lost-time costs. Reduce accidents and you keep your drilling "team" together, thereby speeding up operations and again reducing costs.

New Personnel

Warren points out that there are now nearly 2000 rigs operating in the U. S. compared with fewer that 1500 before the war. This has brought in new personnel who are sorely in need of instruction, particularly safety lessons. Also, many who went to war have returned to find new techniques and new tools which will be discussed in the rig conferences.

Warren hopes that the reduction in labor turnover will come about through:

1. A decline in accident rates, keeping the mem able-bodied and on the job.

2. Increased efficiency through information obtained in the conferences, thereby lessening the chances of dismissal.

3. A heightened loyalty to the company which will follow when every employe is convinced that the firm is truly interested in him. The loyalty program is one of the most difficult faced by the Plan and its solution will be slow to reflect on the cost books. The irregular employment and frequent moves to distant locations are a curb to employe loyalty. But Warren believes that if a particular company comes to be known as a good, considerate firm to work for, then the drilling "team" will be broken up less frequently, thereby maintaining efficiency.

Brad Mills, executive vice president of the AAODC, declares that "This program, supplemented by periodical short technical courses such as mud schools, engine training, etc., should be the permanent, continuous, long-range plan of training for the industry for several years to come."

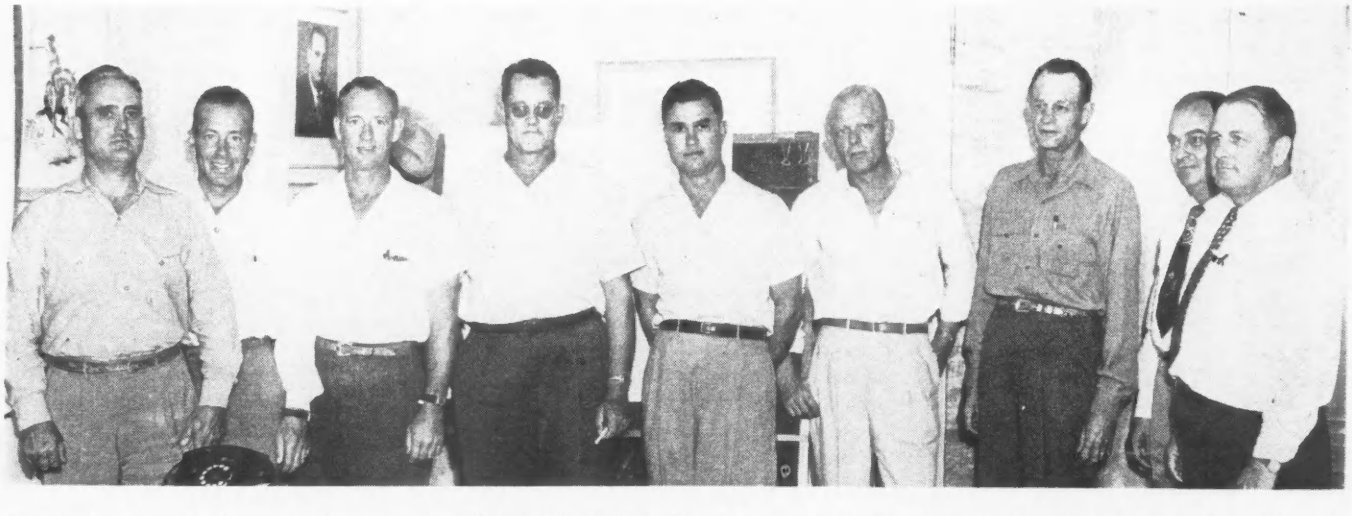
Stocks Below Prewar Levels

■ CONTINUED FROM PAGE 42

estimates averaging 60 million or 34 days' supply. In prewar years, October 1 stocks of motor fuel were 37 to 46 days' supply, and in recent years they have been around 32 or 33 days' supply. At the middle of this year, motor fuel stocks were 45 days' supply, only slightly higher than in the past several years, while before the war midyear stocks were 50 to 58 days' supply. All these figures show that gasoline stocks have been well in hand and that they do not threaten to exceed levels that were normal before the war.

At the middle of this year, stocks of distillate fuel oil equaled 67 days' supply, about the same as in 1939, 1940, and 1941. In recent years they ranged from 43 to 49 days' supply at midyear, but those stocks resulted in shortages or threats of shortage. While present stocks are relatively high, it is indicated that buyers have been holding off on purchases and that delayed buying may draw heavily on stocks.

Stocks of residual fuel oil at midyear 1949 were 47 days' supply, compared with about 30 days' supply in the past several years. However, residual demand is showing material improvement, due to lower residual prices, and some East Coast marketers now regard stocks east of California as lower than desirable. Prior to the war, residual stocks were far higher than at present, having represented more than 70 days' supply.



Participating in an Employer Unit Plan meeting of Carl B. King Drilling Company were these officers and employes of the firm. Left to right, they are Roy Douglass, drilling foreman; Clint Brady, field engineer; Frank Douglas, drilling foreman; C. J. (Dutch) Jensen, general superintendent; Guy Simmons, Jack Forgerson and T. T. (Preacher) Thompson, drilling foremen; Don Johnson, office manager; and J. E. Warren, president of the company.

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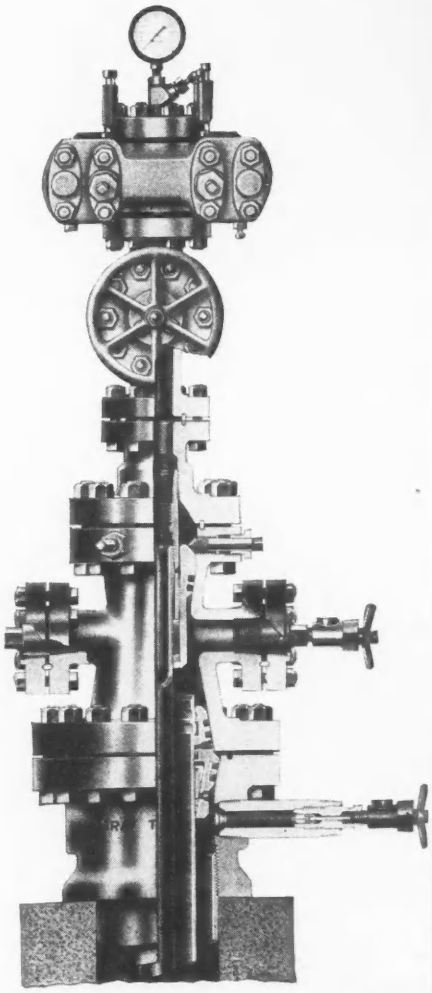

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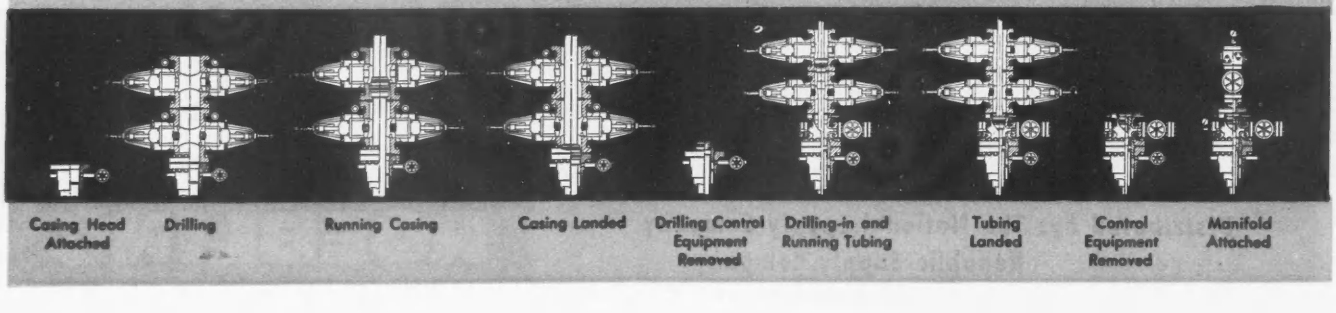
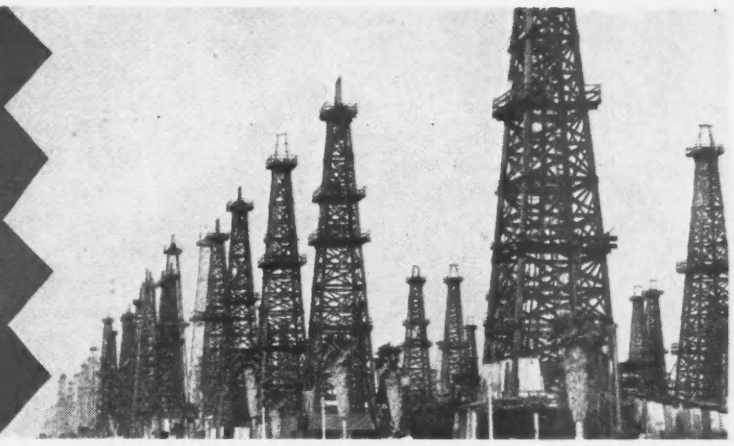


Closer Well Spacing May Profitably Yield Extra Oil



By C. W. TOMLINSON

ENCOURAGED by a good price for oil, American operators found last year in the U. S. nearly twice as much oil as we used. Contributing to this result were not only the discoveries of new fields and usual development of established fields but also the development of commercial oil reserves that had been left behind in old fields, where early wells had been drilled too far apart. This does not refer to flooding or repressuring. Some reservoirs are too lenticular for successful application of those methods. The development referred to is the drilling of infill wells among the old ones. It's a type of secondary recovery that is well adapted to some shallow fields, though out of harmony with some engineering theory. If it produces oil at a profit, that's the meat of the cocoanut.

The fact that it does make money in some cases, where the wells are cheap, justifies re-study of the theory which held that the older wells were close enough together to recover all the oil that could be profitably extracted from the reservoir by primary methods. How large are these "lost reserves" in the U. S.? Are we now creating more "lost reserves" by drilling new fields with wells too far apart?

State Commissions

We have state boards or commissions to regulate the oil industry. In general, operators have gotten along well with them, for they have realized that a healthy industry serves the public better than a sickly one, and they have been conscientious public servants.

Some of the hearings before these boards are clear sailing. In those cases, all of us are agreed as to what we want, and what we want seems obviously to the advantage of the public, too. That makes it easy for the commissioners.

But occasionally we are ungrateful enough to put these good men in a tough spot. We come before them with experts who contradict other experts. One group claims that its method will result in the greatest public benefits. The other is sure that the opposite course will be far more beneficial. And the poor commissioner has to decide between them.

One subject which has brought forth such arguments for 30 years is well spacing. There is still fire in it, and strong clash of opinion; though in recent years the advocates of wider and wider spacing have seemed to sweep the field, in the Mid-Continent and on the Gulf Coast. The Californians have been more conservative.

In a hearing to fix the proper spacing of wells in a new field, it is customary for witnesses to offer estimates of oil recovery. And nowadays, one seems to get in wrong with Emily Post if his estimate of total oil recovery from the field is any smaller for wide spacing than for close. Much of the industry has been sold on the idea that even primary recovery is just as great from few wells as from many.

Energy per Barrel

Now this implies that you're going to get more from each well when you space them far apart. That has been the universal experience, other things being equal. Yet when the theorists attempt to explain why the oil can move farther without using much more energy per barrel, they forget that faster flow altogether. They then assume that the rate of flow into each well will be just as great if the wells are close together. For only on that assumption is their mathematics correct, which seems to justify wide spacing. And that assumption is wrong.

If your engineers are sold on wide spacing, ask them to figure the energy consumption per barrel of oil produced, on the contrary assumption that the natural rate of production is greater for wide-spaced wells, and increases as the distance between wells grows greater. That assumption is fully verified by experience.

And if he says, "But we don't produce

UNDER FAVORABLE crude prices, important additions to U. S. domestic petroleum reserves have been made by drilling fill-in wells among the old ones in older fields. In such cases both the operators and the nation have profited. This delayed development of commercial reserves that were left behind in old fields shows the need for restudy of the question of proper well spacing. Although wider spacing has been actively promoted, both oil and profits can be sacrificed by drilling too few wells and failing to get economically recoverable reserves. This discussion of an important problem is from an address of greater length entitled "American Oil Reserves," given by Dr. C. W. Tomlinson at the midyear meeting of the Independent Petroleum Association of America at New Orleans May 2. An independent consulting geologist and oil producer, Tomlinson is president of the American Association of Petroleum Geologists.

at the natural rate. The flow of our wells is restricted," then ask him one more question. Ask him what becomes of the energy he saves by restricting production. If the restriction is accomplished by a choke, the supposed saving in energy is represented by the back pressure against the sand. But in each barrel of oil that comes to the choke, what happens to that back-pressure, to that "saved" energy? Is any of it left when that oil hits the stock tanks?

Ask him, too, to figure out how long it will take for oil to reach your well in the center of a 40-acre tract, from the edge of the 40. It's not hard to figure. For example, suppose a well is making 100 barrels a day from 100 feet of sand. That's a pretty good allowable, these days. Oil moves into such a well many times faster than into the average American producing well today. Assume 20 percent porosity, and 25 percent shrinkage of the oil between the pay sand and the stock tank. One foot from the center of your well-bore, that oil is moving only three inches an hour. And 330 feet back, if there's no water drive, it's moving not more than 1/6 of an inch per day, or five feet per year. Its average speed from the edge of the 40 to the well will be less than that. The journey will take at least 130 years—longer if the well declines. Have you ever had a well that produced 100 barrels a day for 130 years? With declining rate of flow, 1000 years is nearer the true time required for that trip.

Engineers bring to court estimates of primary recovery as low as 15 percent of oil in place. We should be ashamed to admit such inefficiency. What actually happens in such cases is that we recover perhaps 75 percent of the oil that was in place in a few acres close to the well, and none at all from the other 30-odd acres. It just doesn't have time to get there. And the natural reservoir energy is exhausted before it does.

Spacing Limits

There are limits, "critical spacing," beyond which closer spacing will be of no avail. There are economic limits, too, for there's a real advantage in the larger recovery per well for wide-spaced wells.

Primary recovery per well increases with increasing distance between wells. But recovery per acre diminishes, in the opposite ratio. More wells, on the average, do get more oil. They get it in the proportions noted in 1924 by W. W. Cutler of the U. S. Bureau of Mines: Four wells on the same 40 get twice as much oil as one well will get. If the extra oil will pay for the other three wells, and then some, they are worth drilling. If it won't, they shouldn't be drilled. But where they would increase the operator's profit (and that means the country's profit, too), and he doesn't drill them, he is leaving half the oil in the ground that he ought to get by primary recovery. He may get it by other methods, but they may be more expensive still. You can't drill these belated infill wells to a deep sand whose pressure has been depleted, and get your money back. That's a game for shallow reservoirs only.

A few years back the API Well-Spacing Committee performed an important service to the industry by assembling from many companies detailed engineering data and recovery statistics and estimates from more than 100 oil fields. They included a great variety of reservoirs, in sand, in dolomite, in limestone; fields with natural water drive, and fields with none. They ranged in depth from 1000 to 10,000 feet.

R. C. Craze and Stuart Buckley, engineers, published these data, and reported that they could find in them no clear evidence of any relation between well spacing and recovery of oil.

Added Recovery

However, over two-thirds of the fields covered were similar to this extent: they were in sand reservoirs, and had natural water drive. When these fields are studied separately in groups of limited depth range, the added recovery obtained by close spacing of wells appears very clearly. For example, 28 of these water-drive sand fields are between 2500 and 5000 feet. Eighteen of them had less than 20 acres per well; ten had more than that. In fact, there were on the average four times as many acres per well in the wider-spaced ten fields as in the closer-drilled 18. In the wide-spaced group, estimated ultimate recovery averaged only 458 barrels per acre-foot of pay. In the close-spaced fields, it averaged 900 barrels. That's a 96 percent increase.

Had the ten wide-spaced fields been drilled as closely as the others, and obtained thereby an equal recovery per acre-foot, they would have recovered 163 million more barrels of oil than they did. That would have required 2152 more wells, an average yield of 75,500 barrels per well. At an average cost of $40,000 per well, they would have had to clear 53 cents per barrel above operating costs to make a profit. Some would have, some would not, at the prices we have had for oil. In some, ten-acre spacing would have been most profitable; in others, 20. In deeper fields, even at good prices for oil, 40 acres or even more may be best. But the important thing is to recognize that the extra wells do get more oil, that there can be waste in drilling too few wells, and not only in drilling too many. The most profitable spacing for the nation, as well as for the operator, is the one that will make the greatest total profit.

Secondary Methods

It is claimed that you can get the same recovery and more by water-flooding or repressuring, or pressure maintenance. These processes do increase recovery. In many cases they increase it greatly. But they do so in close-spaced fields as truly as where the wells are far apart. Wide spacing means that oil has to be moved farther under secondary recovery methods as well as in primary natural yield. That takes more energy, and energy costs money.

Can secondary processes be used as a substitute for closer spacing, and get the same results at less expense? There's the practical question. These great gas injection plants cost money—money by the million. They cost so much that we hear it said that, of the many great recycling plants which have been installed in distillate fields, not one has yet paid out, or is even sure of paying out.

Wide spacing wastes energy, whether it be primary reservoir energy or the energy you pay for when you force gas or water into the sand in secondary recovery. And this waste is not just peanuts. It is vast. If the wide-spacing vogue of the past 20 years has placed the average well even 50 percent farther from the neighboring wells than the distance that would have yielded greatest profits, at least 10 billion barrels of oil has been left underground that could have been produced at a profit in primary recovery. If the same practices continue, the ultimate loss in the U. S. alone could reach several times that figure; and in the world, to hundreds of billions of barrels.

Secondary methods will get some of it. Some of it is forever lost because of too-wide spacing. These are our lost reserves. We are still adding to them by the same mistaken practices. Wide spacing is being preached, even in the movie "Tulsa."

Fortunately, some operators have not fallen for wide-spacing propaganda. The common sense of many independents, their reliance on actual experience instead of on erroneous theory, has kept them on the right track. The nation's oil reserves are greater than they would otherwise have been. In California, thanks to an overwhelming mass of experience proving greater recovery—and greater profit—from close spacing, few operators, large or small, have been sold on the opposite idea. It is said that 80 percent of the increase in California's oil reserves since the war has come from additional drilling in old producing areas.

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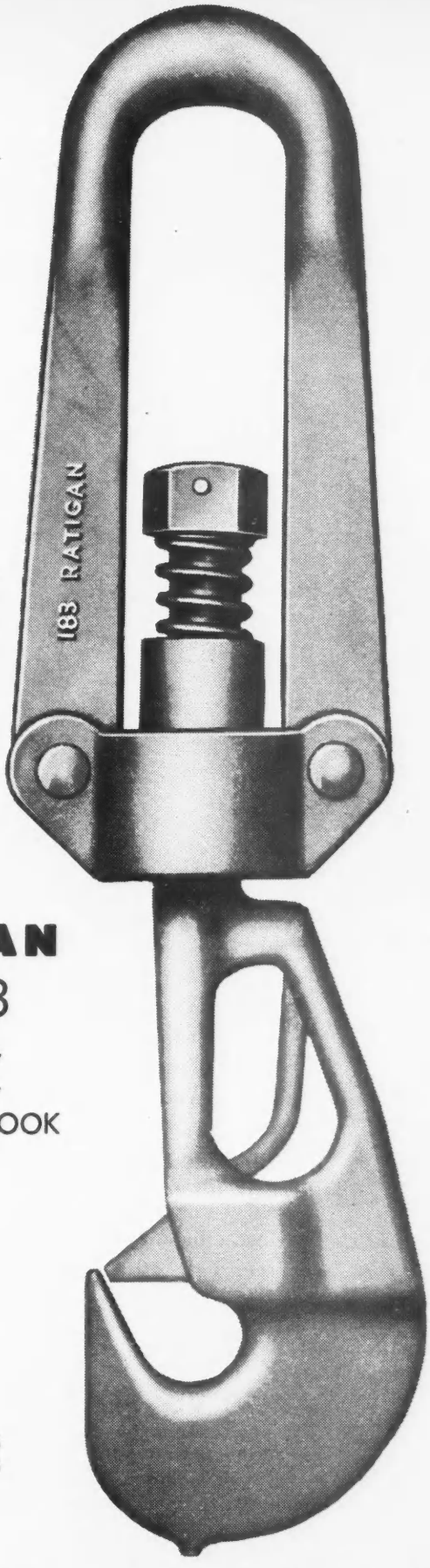

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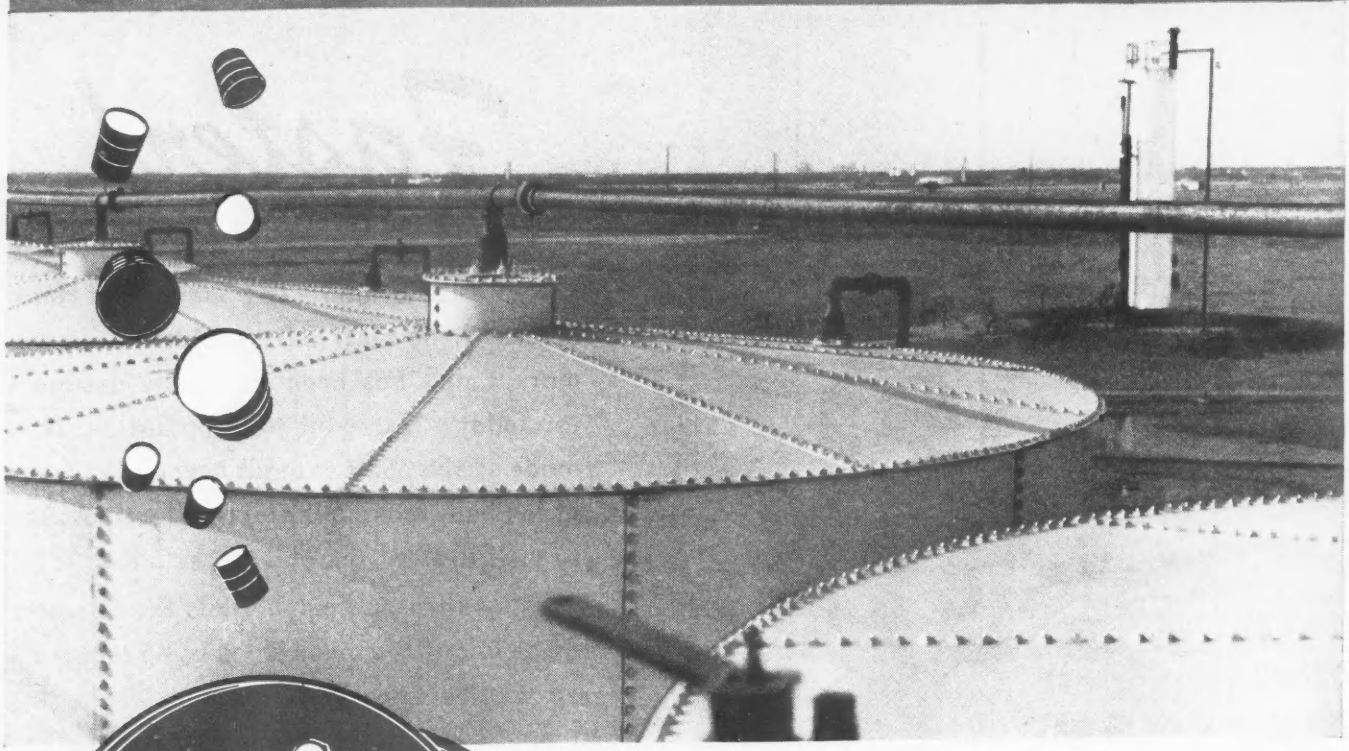

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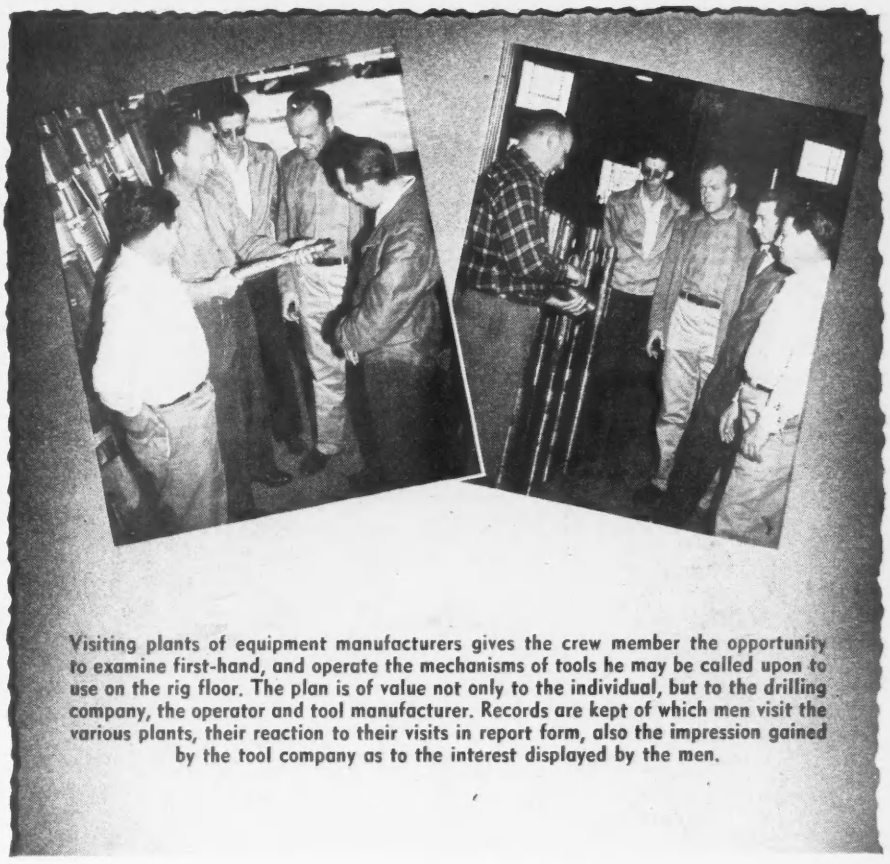
Plant Visitation Plan

Benefits Drilling Crews



Visiting plants of equipment manufacturers gives the crew member the opportunity to examine first-hand, and operate the mechanisms of tools he may be called upon to use on the rig floor. The plan is of value not only to the individual, but to the drilling company, the operator and tool manufacturer. Records are kept of which men visit the various plants, their reaction to their visits in report form, also the impression gained by the tool company as to the interest displayed by the men.

By A. J. HEISER

Petroleum Engineer, Brown Drilling Company, Long Beach, Calif.

CREWS OF DRILLING company systematically inspect plants of equipment manufacturers and gain better understanding of the tools with which they work. Plant inspections originally were arranged for workers going into foreign service and value thereby demonstrated led to extension of idea to domestic workers. Tours are beneficial to individual workers, making them better fitted for their jobs, and drilling company benefits by better workmanship. Equipment makers cooperate, as they gain through better performance of their tools.

THE practice of sending complete drilling crews through the plants of oil well drilling equipment manufacturers is materially beneficial to the men, the drilling company management and the operator. The scheduled tours, made available on a voluntary basis to drilling crews on their days off, give the men a chance to learn first hand, by close inspection of tools and cut away models, the operation of the equipment. Tool manufacturers have received the plan favorably for it is to their advantage also that their equipment be used properly and by informed personnel.

Brown Drilling Company of Long Beach, Calif., is conducting its men on selected tours through manufacturing plants in the Los Angeles Basin area. The purpose of the tours is to make the employes more familiar with the workings of the tools they operate in performing their everyday jobs. The accomplishment of this purpose will decrease down time, and make a more efficient application of operating time possible. It will result in more profits to share for each man, and a more economical job for the operator.

The factory tour idea for local drilling crews is actually an extension of a plan that has been in effect since August, 1948, for foreign employes of the company. Foreign operations usually do not have the benefit of specialized service and repair men, and the only available substitute is the ingenuity of the men on the crew. To provide a background for this ingenuity, the company arranges for each man two weeks to a month's instruction at designated plants before shipping him out. The notes he makes invariably aid him in the campaign to eliminate lost time. The same system is applied to men returning from a foreign contract if they plan to return to foreign duty. The success of the plan in helping overseas operations prompted the idea that a domestic project would work with equal results.

Tool Companies Cooperate

The tool companies have been very responsive to the idea. They have expressed the opinion that their compensation for the cooperation they offer in opening their plants to interested groups will come from the improved performance their tools will render, an inevi-

■ CONTINUED ON PAGE 58

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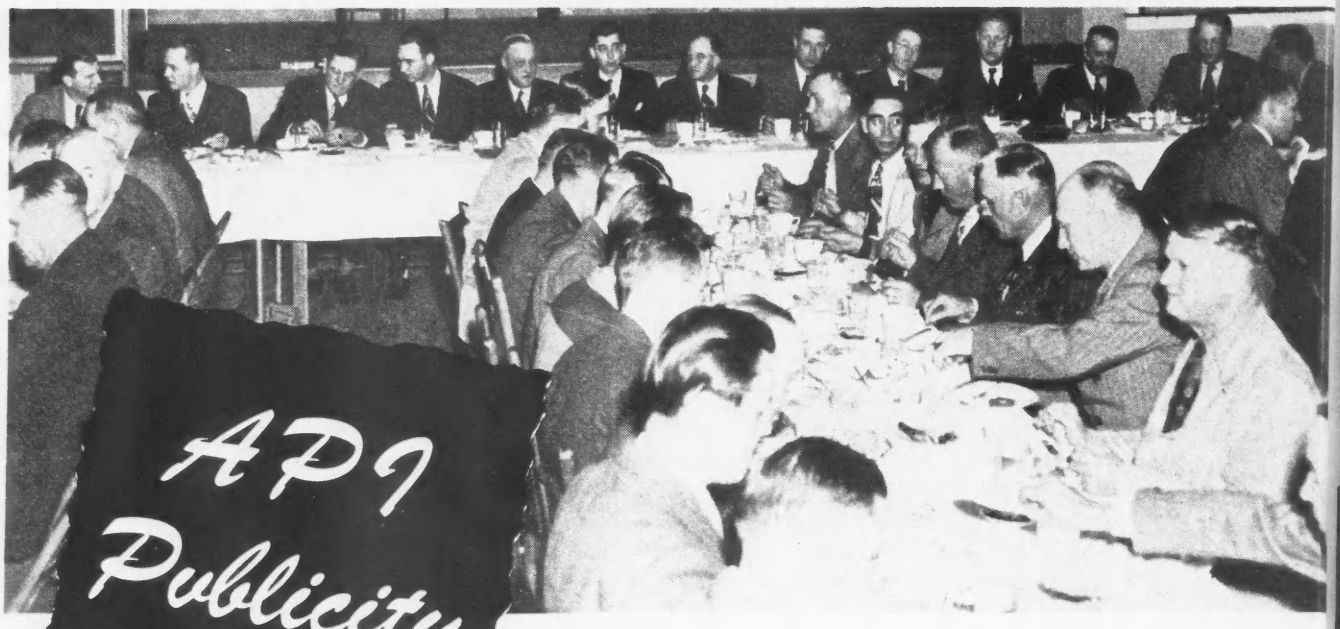

API Publicity Program Produces Results

By ANTHONY GIBBON
Staff Writer

AN OUTSTANDING job of public relations, "selling" the oil industry and its employes to landowners, merchants, and citizens generally, has been done in an important Oklahoma oil-producing district by the Golden Trend Chapter of the API. People outside the industry have been shown convincingly that oil men and their families are desirable citizens; that the industry is a valuable asset to the region.

IN GARVIN County, Oklahoma, where the country's broomcorn industry flourishes, about 20,000 landowners, merchants and business men in a dozen communities have, during the past two years, come to know, respect and like the oil industry and the men who drill the wells, produce the oil and generally make the wheels click.

Thanks to the success of a "grass roots" public relations program initiated and carried forward by a group of sincere oil men working in the prolific fields of the so-called "Golden Trend" area . . . second largest oil producing district in Oklahoma . . . landowners, merchants and business men realize that the oil worker is not a rowdy, boisterous "here today and gone tomorrow" character, but a substantial, sober citizen contributing to the economic and spiritual life of the communities where he and his family now reside.

Thanks to the efforts of such men as W. E. Best, petroleum engineer; Ned Biffle, with B. and B. Drilling Company; and, outside the industry, to men such as State Senator Jim Nance, the late State Senator Homer Paul, O. B. Moody, president of the Lindsay Chamber of Commerce, and others, an oil field worker, whether engineer or roustabout, can walk the streets of Pauls Valley and other communities in the Golden Trend area and feel that he "belongs." This was not so about two years ago. Then he would have found no welcome and might have encountered ill-concealed hostility from townsmen who frankly declared that their only interest in the newcomer was in his pay check. Or he might have tried to find a place to live at Maysville, or Lindsay, or any nearby community and been firmly refused. The "No Oil Field Workers Wanted" sign, while not actually in the window, might just as well have been, for all the encouragement the oil field worker received in his search for a place where he and his family might live.

It was for the purpose of breaking down this hard core of resistance and misunderstanding, that the Golden Trend Chapter of the API was organized two years ago. "Abie" Best, at that time petroleum engineer with The Ohio O Company and residing at Pauls Valley ramrodded the organization and, throug the cooperation of other engineers an field men, set out to "sell" the industr to outsiders.

A spot check among community lead ers revealed the prevailing hostilit against the oil industry, generally, an oil field workers in particular, stemme from the belief that an oil man was rowdy, drunken, boisterous ne'er-do-wel and that oil companies were predator organizations whose express purpos was to defraud the landowner, ruin hi crops, and deplete the natural resource of the region without regard for th future.

Memories of Seminole's bawd "Bishops Alley" and similar sink hole of former boom towns throughout th Southwest were vivid in the minds o the men and women who lived in th quiet prosperity of the fertile Washit Valley. They were determined that n such boom towns with their accompany ing disorder would be permitted. As on landowner expressed it: "Oil money i dirty money. We'll have none of it. W want no roughnecks in Garvin Count and we're going to do what we can t keep 'em out."

The Golden Trend pools lie in a gre stratigraphic trap area along the ea flank of the Anadarko Basin. About 6 wells produce approximately 50,000 ba

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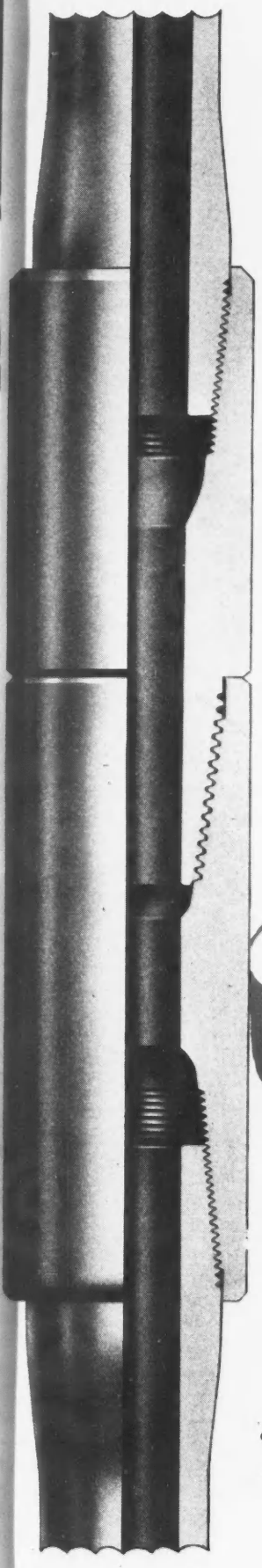

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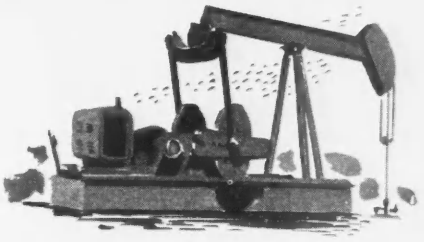

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rels of oil daily and constitute one of Oklahoma's most important oil reserves. It is vital to the successful development of this oil country that cordial relations exist between the local population and oil field personnel. Unlike many oil areas the pools in the Golden Trend are located in a highly developed and prosperous agricultural region where the value of the surface land often exceeds values of oil-producing lands in other sections of the country. So far as the landowners and merchants were concerned, they were doing all right and had no need for the oil industry.

This antagonistic attitude had economic repercussions from the beginning of oil development in the area. Land and lease men found it difficult to do business with landowners; geophysical crews not infrequently were barred from locations; a host of small damage suits piled up against drilling contractors and operators. Hostility even was reflected in the State Legislature where those outside the industry let their representatives know that they were opposed to anything that smelled of oil.

Best and his group realized that if they and their families were to live and work under normal conditions it was up to them to sweep aside prejudice and win the confidence and support of landowners, merchants and business men in the surrounding farms and communities. The idea of a local API Chapter appeared logical, but organizers realized that special problems demanded a special type of chapter activity. It had to get to the "grass roots." Unlike most API Chapters, emphasis, at least for the time being, had to be placed on carrying out a good public relations program rather than on engineering and technology.

The organizational meeting of the Golden Trend Chapter, API, was held at Pauls Valley December 10, 1947. Prior to the meeting, Best and a special committee called upon Chambers of Commerce leaders, newspaper publishers and editors, and other key figures in the area and invited them to the meeting. Approximately 90 attended, of which perhaps a third were outside the oil industry.

The meeting proved to be the opening wedge into the core of misunderstanding in the area. For the first time local residents and oil field workers met in common fellowship around the fraterna board. Those outside the industry were told about the oil industry and what it could mean to Garvin County. The important role played by the oil industry in the development of the Southwest was unfolded. Engineers reviewed the efforts undertaken and outlined development projects in the making for southern Oklahoma in general and Garvin County in particular. Payroll figures were cited; equipment manufacturers and sales and service organization inventories were summed up.

But more impressive than these important economic features was the frank, man-to-man discussion of current, day-to-day problems confronting oil industry personnel and those outside the industry. For the first time, perhaps, the landowner, merchant and business man realized that the roustabout, the roughneck and the engineer was not necessarily the "boom town" rowdy and the scum of the earth, but another American trying to do a job. He realized, perhaps for the first time, that the oil field man was a hard-working fellow citizen trying to make a home in his new environment and that he had much more to offer than just a pay check. There was his wife, who could be as pleasant and sociable as any American wife and mother living in Garvin County, and there were his children enrolled in the same county schools with his own son and daughter.

When the meeting concluded, Chairman Best opened the chapter ranks to all who cared to join and who were interested in knowing more about the oil industry and what it planned to do in Garvin and sourrounding areas. The invitation was readily accepted.

Of course, opposition was not dispelled overnight nor after this first social gathering. Subsequent meetings have since been held in every important Garvin County community. One such meeting was held in the Methodist Church building at Purcell and was very well attended. So effective, however, was that first round, that at the chapter's second meeting about 130 were present, representing a good cross-section of the county's business and agricultural life.

Currently the Golden Trend Chapter has a membership of about 350, and they are about equally divided between the men who earn their living directly from the oil industry, and those who do not.

Monthly programs are carefully prepared in advance by chapter officers. Besides a social feature such as a dinner or barbecue, the program generally includes an oil industry speaker who discusses some oil topic of general interest to oil personnel and those outside the industry such as conservation, well drilling, oil production methods, etc. The talks are for the most part non-technical so that those outside the oil industry may understand. These talks enable the landowners to realize that their oil is being produced in the most efficient and economical manner, and that pool development is being conducted with the speed and precision of slide rule operation. They have been made acquainted with modern tools and modern oil production methods. They now understand that the oil field worker respects the landowner's property and is trained to conserve not only the oil and gas which he produces, but the surface and ground waters and the fish, game and other wildlife of the region. They know now that when the oil and gas are gone, they will still have fertile farm lands.

But the work of the Golden Trend Chapter does not stop with its monthly meetings. Members of the oil fraternity carry on a continuous public relations campaign. However, their most potent weapon in this important program is the fine example of citizenship which marks them as welcome members of any community.

Chapter officials and members are in demand by Chambers of Commerce and other Garvin County civic organizations as spokesmen for the oil industry. The chapter endeavors to keep statistical data on the number of wells producing along the trend, the amount of oil and gas being run, the approximate number

Officers of the API "Golden Trend" Chapter are, left to right, Paul Meyers, secretary-treasurer, store manager for Mid-Continent Supply Company, Pauls Valley; A. K. Hood, first vice chairman, production superintendent, Sohio Petroleum Company, Elmore City; W. E. Best, chairman, district petroleum engineer, The Ohio Oil Company, Pauls Valley; Clift Wise, third vice chairman, plant superintendent, Kerr-McGee refinery, Wynnewood; and Ned E. Biffle, second vice chairman, president of B & B Drilling Company, Pauls Valley.

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of oil field personnel and the payrolls they represent in the county. Questions on oil field operations and requests for information on conservation, unitization and subjects which might have a controversial flavor, are answered by chapter officials or members frankly and to the best of their ability.

The Golden Trend Chapter has done an outstanding public relations job for the entire oil industry. Today, harmony prevails between the oil field worker and those outside the industry in Garvin County. The chapter has succeeded in presenting the oil industry in its true colors as a progressive, active industry which brings prosperity to the communities wherein it operates.

The result of this fine work is further reflected in a sharp decline in bothersome lawsuits, the bane of any oil field development; in ability of oil companies to negotiate favorable unitization agreements such as the Southwest Antioch Unit; in legislation favorable to the oil industry brought about by cooperation between local civic bodies and oil companies.

Chapter members make it a point to emphasize among oil field personnel that cooperation is a "two-way street." They point out that if they are to maintain the gains already achieved they must understand the viewpoints and work with the men and women in the communities in which they live. This is applicable especially in drilling operations where efforts are made to maintain high standards of "good housekeeping" on the lease. No oil gushes over crownblocks to ruin valuable broomcorn, wheat or alfalfa lands which, after all, will be there long after the last barrel of oil has been produced from the reservoir. Drilling contractors are cooperating in the program by moving in and out of locations with as little damage to land and crops as possible, and by leaving locations cleared of old debris and with old slush and mud pits filled in.

Perhaps the most significant development to prove that understanding between the oil field worker and those outside the industry has been achieved in the Golden Trend area is the formation by the Pauls Valley Chamber of Commerce of a "Welcome Committee" designed to welcome new oil field workers and their families and help them acquire homes and find a place in the community.

The oil industry owes a debt of gratitude to the Golden Trend Chapter of the API, which has shown the best and most direct method to overcome antagonism to the industry by "selling" that industry to the people in the communities where it operates. This "grass-roots" approach in public relations has paid dividends in Garvin County.

Plant Visitation Plan Benefits Drilling Crews

• CONTINUED FROM PAGE 5

table result of a better understanding of how to use them.

The factories and plants to be visited are divided into two groups. The first includes those companies whose tools are used primarily in the completion stage of a well, while the second is made up of those manufacturers whose tools are used during actual drilling operations.

Visits to Group 1 plants were arranged so the men would familiarize themselves with those tools operated primarily under operator supervision. The majority of these tools are used on the "day-rate" part of a well where the operator pays for the time consumed, and the rental of the tools used. Most of this hourly work occurs at the completion stage of a well after the contractor has cemented the water string in the hole. The men visit seven plants in this group and receive instruction in the operation of such tools as packers, testers, perforation washers, underreamers, and liner hangers. The tours of these plants will help to effect an even more efficient operation while performing day-rate work.

Visiting of Group 2 plants was planned when it was found that the men liked the idea of learning more about the drilling tools they work with. This group includes those tools used on the "footage" part of a well. Under a footage contract, the contractor is responsible for the hole he drills and the tools and equipment he operates. It is therefore directly to his benefit to operate his tools, machinery, and equipment correctly. The eight plants visited in this group specialize in such items as bits, core barrels, reamers, fishing tools, and the various pieces of rig machinery.

Notices Posted

The mechanics of carrying out such a plan have of necessity been kept simple. The toolpushers are given the pertinent data on each factory in each group. An outline of the plan is posted on each rig bulletin board. The driller and his crew notify the pusher what days they wish to make the tours, and the pusher notifies the main office. The office in turn contacts each plant and completes the arrangements for the tour.

Upon completion of the visits, the driller is required to submit a report for his crew outlining what tools were explained, his opinion of the value received, treatment experienced while at the plant, and any criticisms the crew may have of the plant tour idea in general. The people in charge at the plants also send a letter confirming the visit,

Inspection of cut-away models enables the crew member to better visualize the operation and function of special tools when they are run into the well. The manufacturer is interested in having crews understand his tools, for it assures him that they will be used properly and thus give the service for which they were designed.

and stating their impression of the interest and attitude of the men.

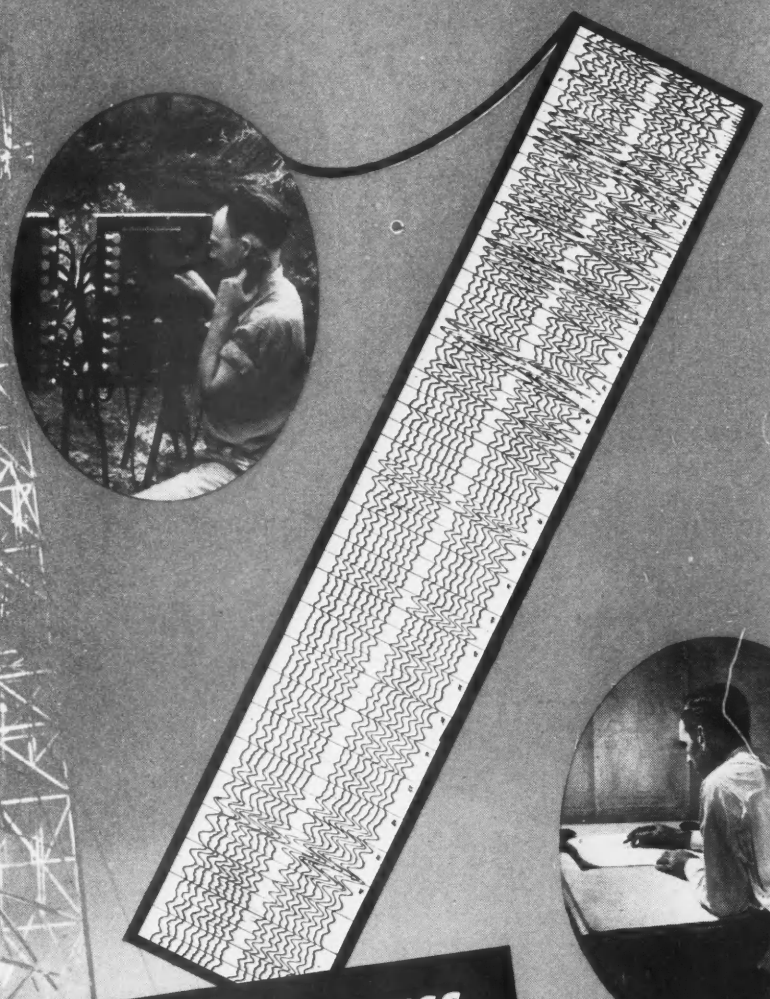
An additional element which enters into the plan is one which is beneficial to both men and the drilling company management. At the office, a complete tabulation and record is maintained which shows at a glance which men have visited the various plants. Since the plan is on a strictly voluntary basis, management learns which men who have sufficient interest and initiative to increase their knowledge of drilling techniques and the tools they use on the derrick floor. When advancements or salary increases are to be made, it is certain that plant visitation records of the men concerned will be considered.

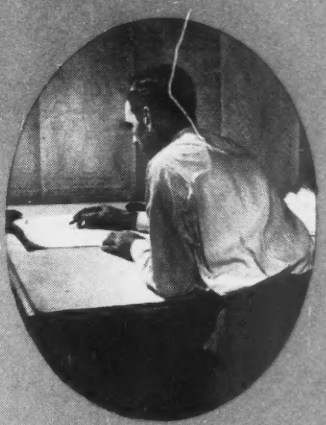
Sixteen drillers, 17 derrickmen, and 55 rotary helpers have made the plant trips. They have done so in crews voluntarily and on their own time. They have been reimbursed only for their expenses.

The factory tour idea also is being used with success by the American Association of Oilwell Drilling Contractors and the Long Beach City College in the instruction of students enrolled in the two-year drilling practices school being sponsored by these groups. This training program is now in its second semester, and includes in its class schedule a course on tools and equipment. The plant visits are an invaluable aid for this type of an educational program.

WORLD OIL

EXPLORATION SECTION





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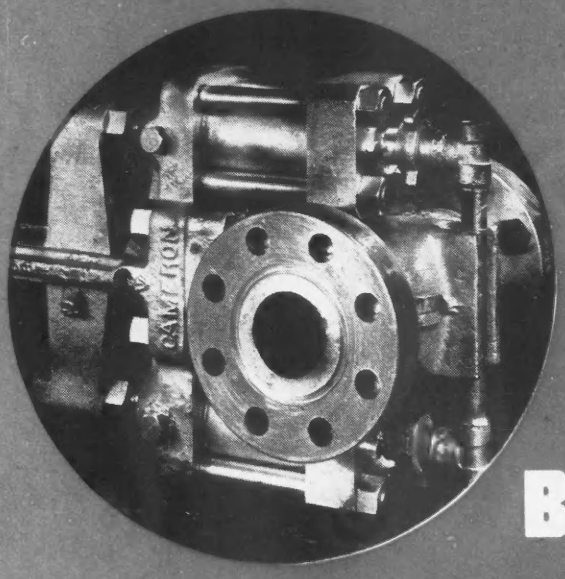

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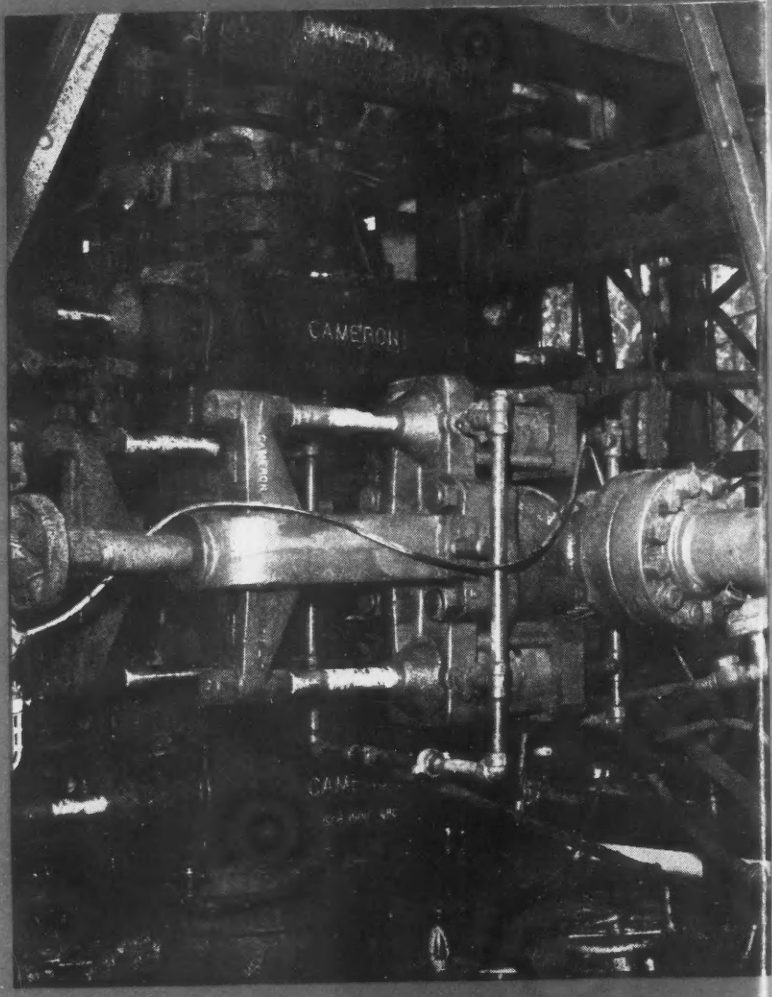

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Origin of Shallow Structures in West Central Texas

By G. H. BRODIE, Geologist, Abilene, Texas

ANY interpretation or understanding of shallow structure involves an interpretation of the causes of structure throughout the section. In the Gulf Coast province of Texas and Louisiana structural origins are ascribable to the plastic salt which underlies most of the readily deformable sediments; in the Rocky Mountain region tectonic forces are the cause of the sedimentary deformations which are observed; likewise, in West Texas tectonics play an important role. In West Central Texas, however, the problem is more subtle and less obviously answered.

In the view of the writer the West Central Texas geologic province has been essentially a quiescent one, with only some slight differential movements in the underlying basement in past Ellenberger time. Since the deposition of the Ellenberger formation, basement movements have been small in comparison with those found in areas which are thought of as tectonically active. There have no doubt been broad regional uplifts and tilting and a certain amount of differential local basement movement, but it seems obvious that both the number and the extent of these local movements have been relatively small; correlatively, it is felt that such basement movement as has occurred has played a minor role in the generation of structure in the sediments overlying the basement.

That this is so is proven by the number of shallow structures in this province which disappear in depth. Innumerable small sharp features have been delineated by the drill and tested in depth, and in many instances it can conclusively be shown that structures with relief as great as 100 to 200 feet in the shallow horizons boast no relief whatever in the Cambro-Ordovician horizons below 5000 feet. In one particular outstanding instance, the highest well in the Cisco in the Noodle Creek Complex Area proved in depth to be structurally the lowest of a group of seven wells drilled to the top of the Ellenberger horizon.

From this and from numerous other instances, it is obvious that there is something intervening between the beds immediately overlying the basement and the relatively shallow Cisco and Basal Permian beds which act as a structure-producer without benefit of positive structural movement, and many who have studied this province in recent years have come to understand that this agent is sedimentary in character and is related in most instances to "reefing" or to the development of massive, outstanding and relatively uncompactible limestone buttresses over which sediments have assumed a draped attitude during and subsequent to deposition.

IN THE ABSENCE of evidence pointing toward tectonic influences on the formation of shallow structures, the author develops a theory of "draped" sediments which may prove of interest in oil search. This theory is demonstrated to be tenable through numerous fields already proven, and may lead to wider exploration where known relief is slight.

About the Author

G. H. BRODIE obtained his degree in geology from Harvard College in 1938. Since that time he has worked for Fohs Oil Company in Houston, and was district geologist for Crown Central Petroleum Corporation from 1944-46. He is now a consulting geologist with offices at Abilene, Texas.

Massive Reefs

The past five years have revealed the presence in this province of an extreme lateral lithologic gradation of correlative beds similar to that known heretofore in West Texas; massive reefs 1200 feet thick have been found in a stratigraphic section occupied by shales and sands only a few miles distant. The reefs occur in a position in the section ordinarily reserved for either the Canyon shales or the Strawn or the Mississippian or even for all three; some of these reef masses apparently began their growth in the Lower Pennsylvanian times, others began later in the section, and still others began in Lower Cisco time; in several important instances test wells have found the entire section from post Ellenberger to middle Cisco time occupied entirely by a reef mass.

In most instances reef masses such as these boast a rugged topography comprising peaks and valleys, and in a great number of instances the peaks are sharp and porous, and several recently discovered accumulations have been controlled by this combination of topographic reef closure and reservoir characteristics. Chief in importance of this type are the Eskota, Jameson, and Round Top Pools.

"Weak Mirror Image"

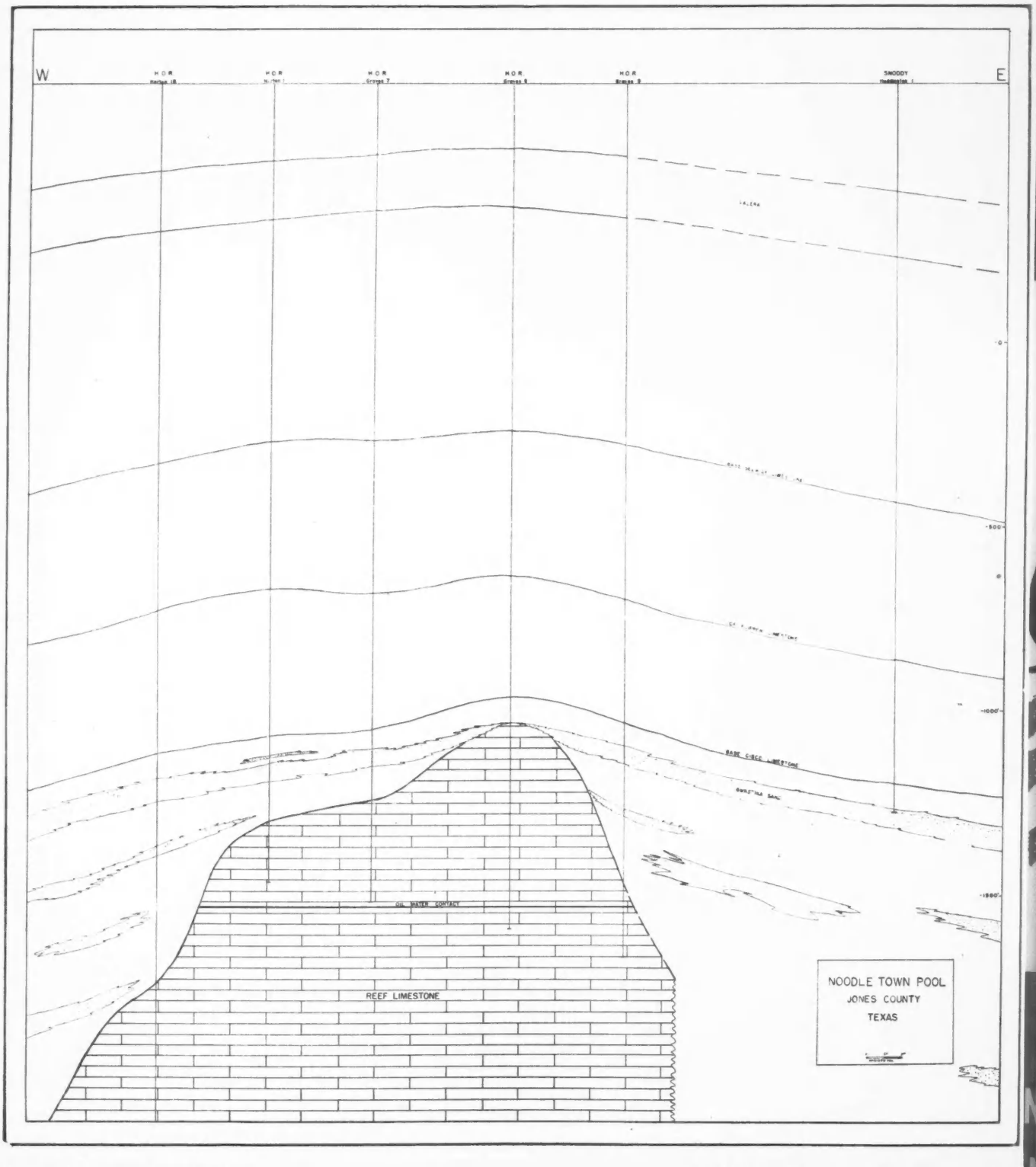
And as should be expected it has been found that sediments deposited over such peaks have "draped" themselves over the relatively uncompactible reef buttresses. Where a good marker has been penetrated and mapped immediately above a sharp reef peak its structural attitude has been found, as would be expected, to approximate that of the reef topography. In thinking of this the writer has often used the term "weak mirror image" to describe this relationship. In numerous instances, the

deformation in the shallow horizons caused by such draping over spectacular reef buttresses such as described is sufficiently great to effect substantial closure and resultant accumulation within the overlying beds. Excellent examples of this are the Wimberly Pool of Jones and Taylor counties and Noodle Townsite Pool in Jones County.

As stated above, reef lime development is the most spectacular sedimentary cause of structure in the shallow horizons in this province; a great deal less spectacular but fully as frequent a cause for shallow structure is the presence in the section of locally distributed sand bodies which have exercised the same buttressing effect as that resulting from the presence of reef masses. As would be expected, due to the relative lesser vertical extent of such sand bodies the resultant draping of the overlying sediments is far less pronounced, and as a result it is of lesser economic importance in terms of resultant closure.

Deeper Beds

Another type of buttress which exerts an influence on the overlying beds is that found in the deeper section. Basement, Ellenberger and Mississippian topographic eminences seem to be sufficiently pronounced to have effected a certain amount of draping in the sediments immediately overlying them; such influence in most instances do not reach very high into the section, however; they seem to be masked by the younger sediments which contain buttressing masses of their own which in turn have affected the structure found at shallow depths Occasionally there seems to be a relation-



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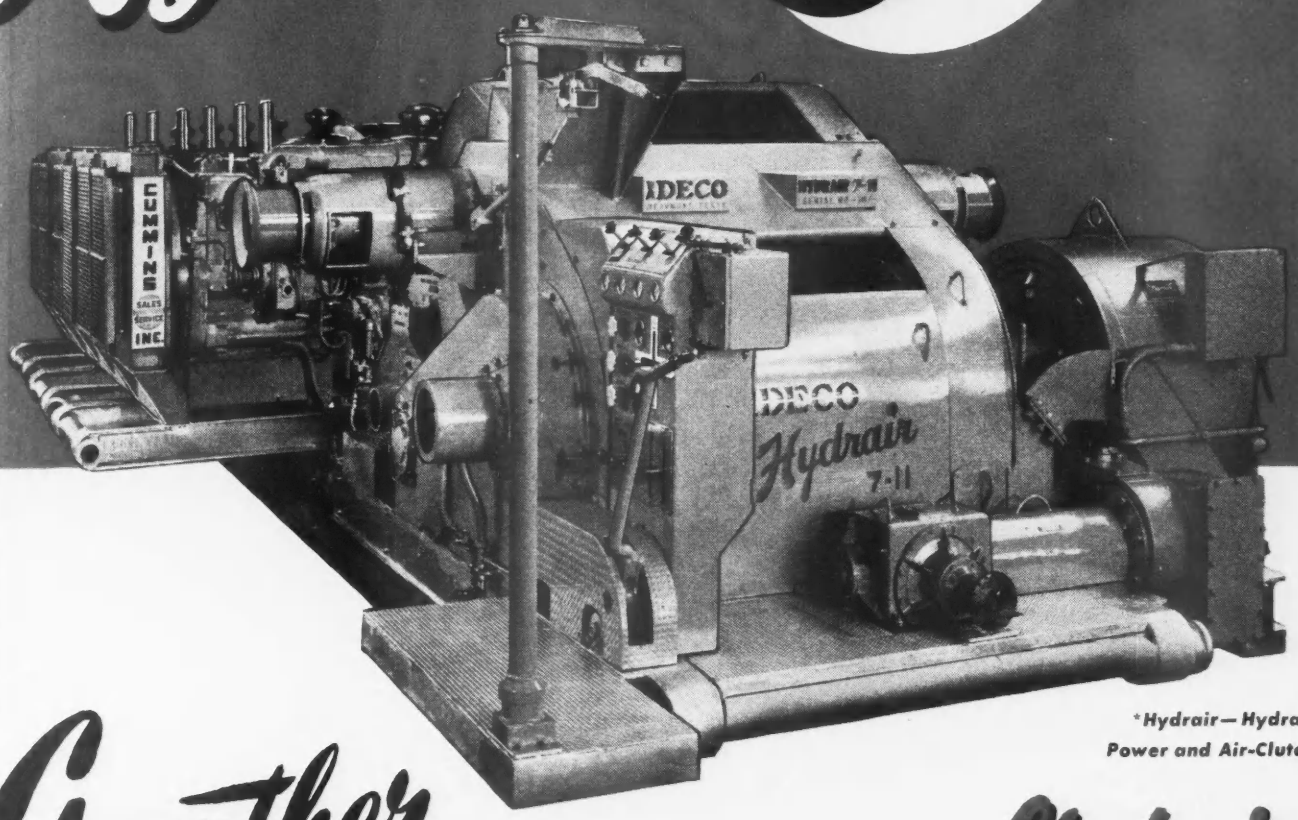

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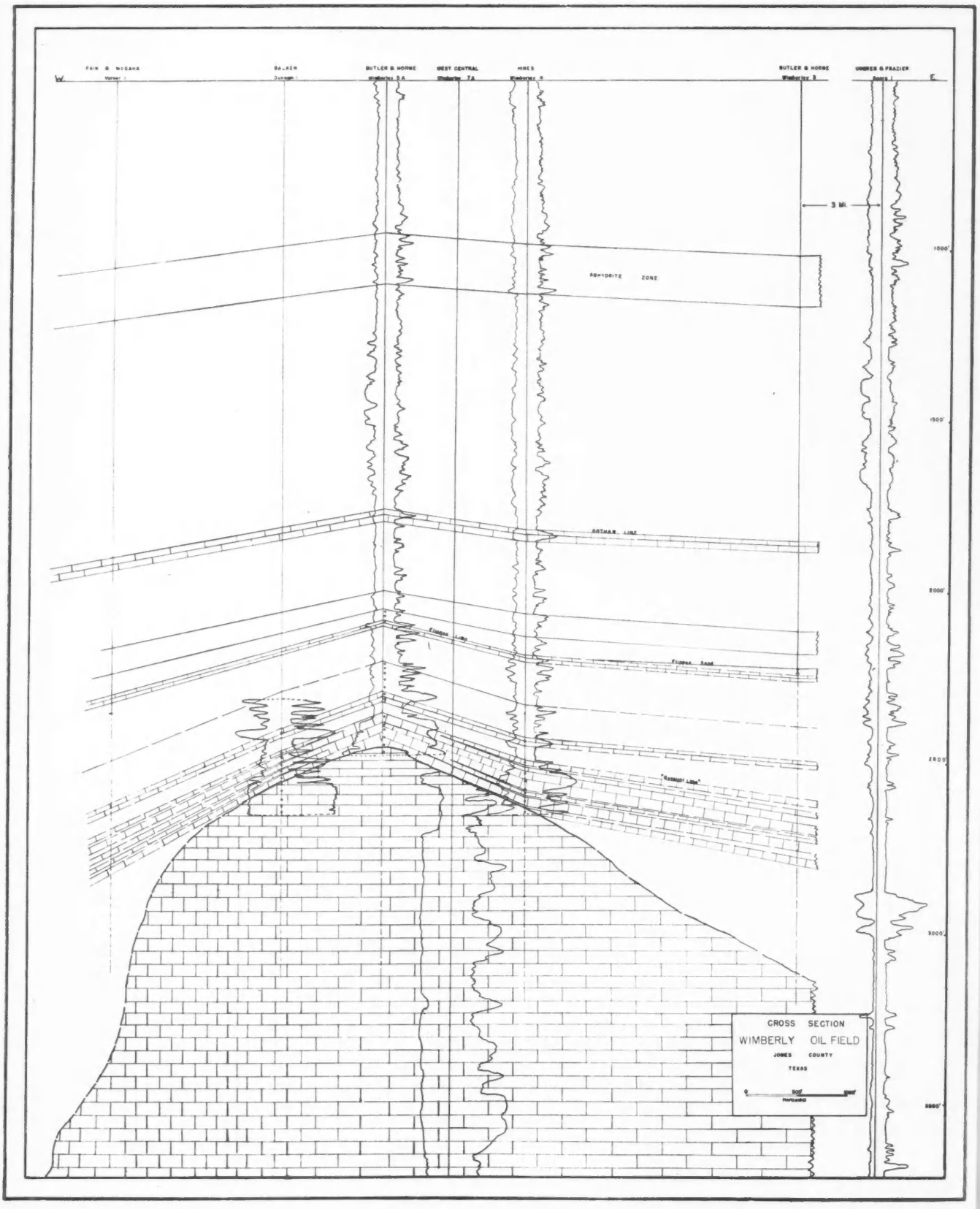
ship between the deep and shallow buttresses, but in most instances there appears to be little or none that can be recognized as such at this time. Structural conditions present in the Upper Pennsylvanian and Lower Permian seem to be related far more to sedimentary factors within this zone than to Post Cambro-Ordovician basement movements or even to deep buttressing sedimentary effects.

Conclusions

In the opinion of the writer most of the shallow geologic structure discernible in West Central Texas is the result of the draping of the sediments displaying such structure over eminences resulting least from tectonic deformation and mostly from sedimentary conditions resulting from the extreme lateral varia-



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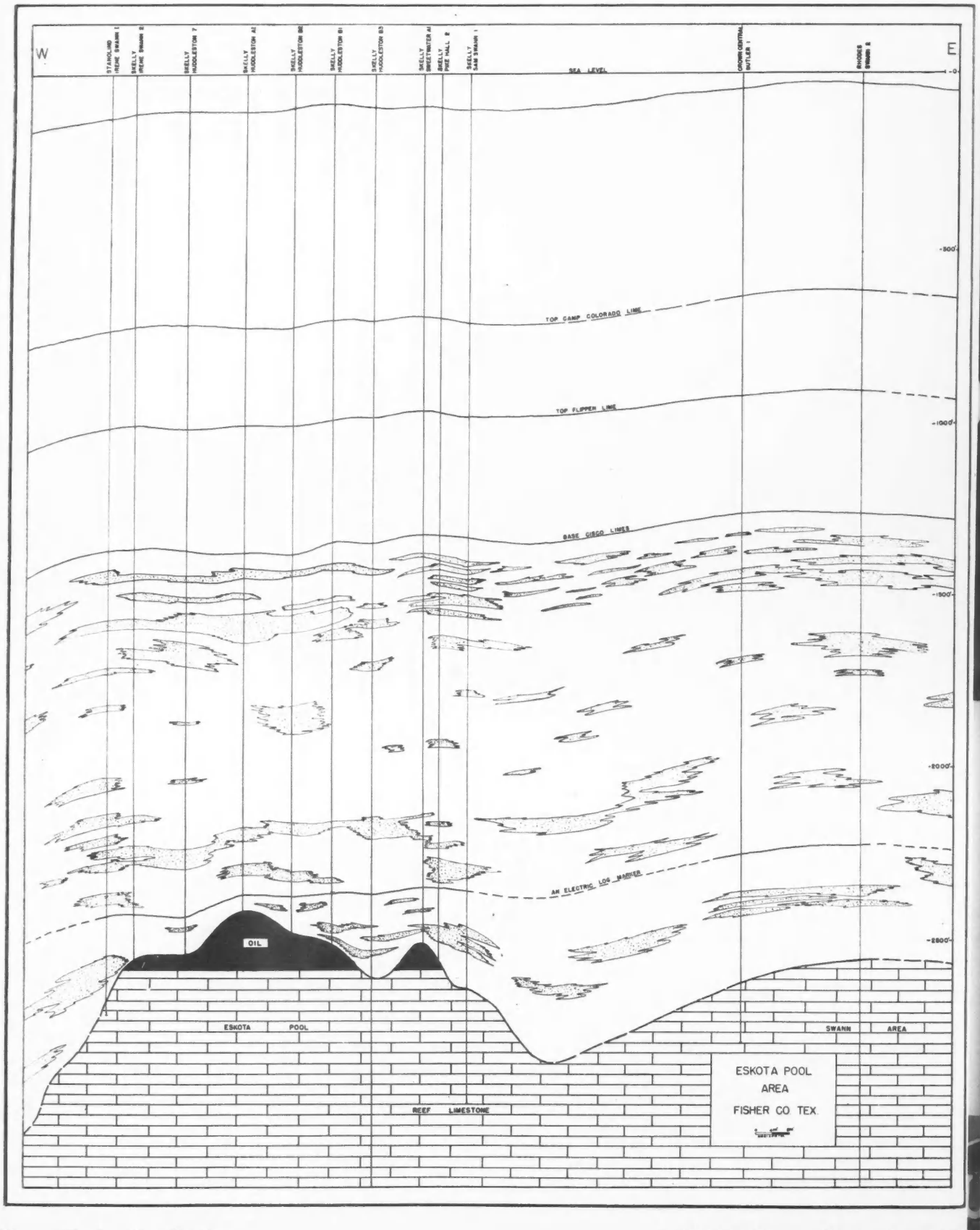
tions in the sedimentary section observable in the Mississippian and Pennsylvanian stratigraphy of the area.

The most important of these buttresses is the so-called "reef mass" of great vertical thickness and often peaked topography. Of lesser importance are the numerous isolated thick sand bodies which cause a similar deformation and draping in the overlying sediments. The number and thickness of the above two types of sedimentary anomalies are so great and the extent of the basement differential movement has been relatively so limited that it may safely be said that shallow structure in West Central Texas is largely due to the effects of sedimentation rather than to tectonics.



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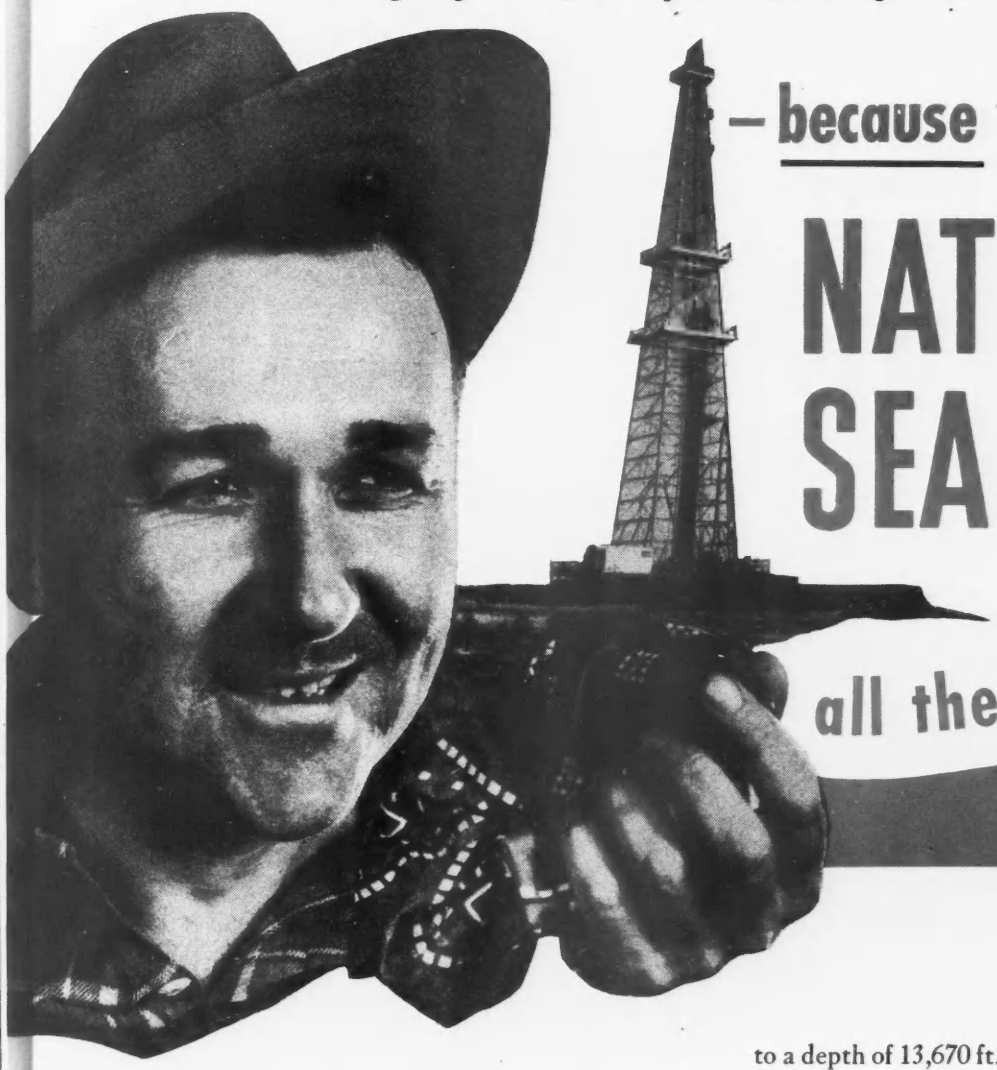

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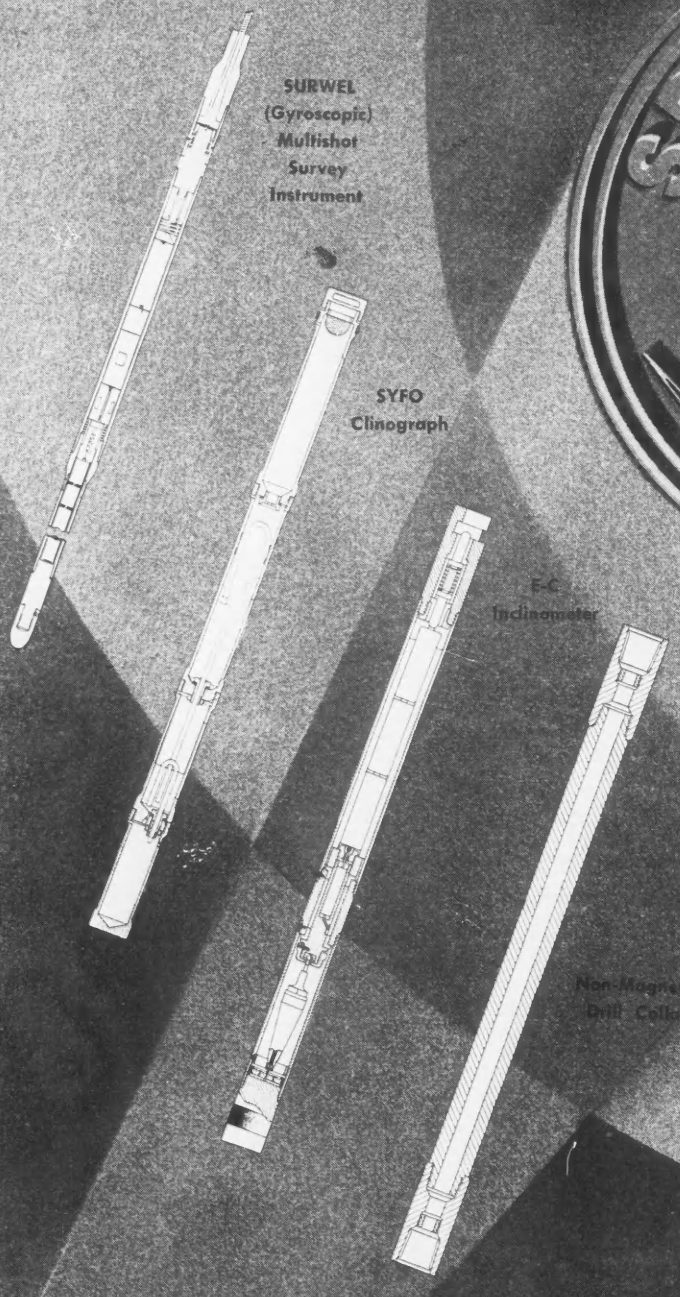

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Aerial view of Gulf Oil Corporation's State of Florida 1, Lease 373, in Coupon Bight of Pine Key, Monroe County. Completed April 1, 1947, as a non-producer at 15,455 feet, this is the deepest test drilled in Florida.

By HERMAN GUNTER

Director, Florida Geological Survey, Tallahassee

POSSIBLY LESS is known about the stratigraphy of Florida than any other state. What is known has been learned through information gathered from the 216 tests for oil and gas and samples and cores from 1640 water wells drilled to the time of this writing. This information was condensed from Information Circular Number 1, dated January, 1949, and published by permission of the Florida Geological Survey, Tallahassee.

THROUGH the years the Florida Geological Survey has published papers and reports dealing with the petroleum possibilities, structure and the geology of the state, but recently there has been a growing demand for more complete information about the early explorations.

We have endeavored to obtain dependable data on the wells drilled years ago, but we invite corrections and additional information. Especially welcome would be driller's logs, newspaper clippings or notes on wells drilled prior to 1910. Such records would supplement the meager and unverified data that we now have on these earliest operations.

Prior to June 5, 1945, Florida had no law regulating the drilling for oil or gas. Since the establishment of the Florida Geological Survey in 1907, however, attempts have been made to record details of all exploratory drilling and also to gather data on explorations made prior to 1907. Because there was no law regulating drilling, information was obtained only through the interest and willingness of the operators to give essential data while the well was in progress, or to submit it after completion.

Drillers of water wells have been quite willing to submit information and samples of the cuttings from wells drilled in almost every portion of Florida. Through the years, such data have resulted in a file of samples and cores from 1895 water wells and oil test borings. These data have proved of inestimable value during recent years in the accelerated search for geological and structural information bearing on the origin and accumulation of oil. These excellent records were at least a factor contributing to the decision of several major oil companies to locate offices and district headquarters in Tallahassee.

History of Development

In earlier years records were not as complete as they now are, and there was less inclination on the part of the operators to release their records. Then, too, the survey organization was more limited in personnel and did not visit the operations. Consequently, the records of those early drillings leave much to be desired. After wells are abandoned it is difficult, if not impossible, to get reliable information. In all instances efforts have been made to verify and re-check the names of the operators, the location, depth, and other data by reference to old newspapers, by visits to persons who may have kept records of such drillings, by interviewing drillers, surveyors, and by

correspondence. Sometimes the sum total of such efforts has been satisfactory, yet for certain wells verified data are still lacking.

Earliest Test

As nearly as has been established, the earliest test for oil in Florida was about 1900 or 1901, at Pensacola, Escambia County. This well was drilled by the Escambia Oil Company at the foot of Palafox Street to a depth of 1320 feet. Apparently this rig was then sold to another local company, Pensacola Development Company, and two wells were drilled: No. 1, about five miles west of Pensacola in what is now New Warrington; No. 2, on East Hill in Pensacola at the intersection of Tenth Avenue and Mallory Street. These wells attained depths of 1702 and 1620 feet, respectively. Driller's logs on both have been preserved and published in Water Supply Paper 102 of the U. S. Geological Survey, 1904, and in the Fourteenth and Seventeenth Annual Report of the Florida Geological Survey.

Upon completion of these wells, interest in this west Florida area seemed to diminish temporarily and the next wells of record were drilled in Sumter County, central peninsular Florida, in 1903. Two wells were put down, the first apparently being abandoned at about 1200 feet because of drilling difficulties, and the second completed at a depth of 2002 feet. It is not known why these particular areas in western and central peninsular Florida were selected, unless it was on the basis of general surface geology. Sumter County lies within the region referred to in literature as the "Ocala Uplift," being that part of Florida where Eocene limestones are exposed at the surface, or only thinly mantled by more recent sediments. It has long been recognized as a regionally geologic high area, and could therefore have attracted the attention of the early explorers for oil in the same manner as it has intrigued those in more recent years.

From these early beginnings the interest in the possibility of oil or gas in Florida has waxed and waned through the years. Some of this interest was prompted by enthusiastic, over-zealous professional promoters whose first concern was personal gain. By far the larger number, however, made serious attempts to find oil, as is evidenced by the several deep wells drilled by operators of high integrity. Even the first wells of record in Escambia County were of this nature, and for those early days, depths of these holes were quite impressive, ranging from 1320 to 1702 feet.

In 1939 a well was completed near Pinecrest, Monroe County, at a depth of 10,006 feet. This was the first well in Florida to attain that depth, and although it did not produce oil, it was drilled under the constant supervision of a trained geologist who kept detailed data on the formations penetrated and who gave personal attention to the collection of cuttings and cores, as well as other pertinent data. The complete information yielded by this deep test, terminating as it did in sedimentary formations at more than 10,000 feet, drew the attention of major oil companies to the possibilities of Florida.

The year 1939, is, therefore, an appropriate dividing point between early prospecting in Florida and the present period of prospecting by major companies. During this first period from about 1900 to and including 1939, there were at least 8 tests drilled. Many of these were very shallow and, except for having been drilled by operators who so designate the well, could hardly be labeled as "o tests." But there were many wells drilled during this first period that are acknowledged to be as completely tested, adequately sampled, and recorded as an well in the state.

As an index, however, of the increase interest and activity in oil prospecting 129 wells have been completed during the period from 1940 to 1949, with five wells in process of being drilled on January 1, 1949. It was on September 2 1943, that Humble Oil & Refining Company completed Gulf Coast Realties Corporation 1 at a total depth of 11,626 fee and brought in the first oil well Florida. The initial production was barrels of 20.8-gravity oil and 425 barre of salt water. This well continued producing until May 14, 1946, when, due to decrease in production, it was plugge and converted into a salt water disposal well.

The solid dots shown on this map of Florida indicate where the 216 wells have been drilled in the state.

Producing Wells

This first well, Gulf Coast Realties Corporation 1, did not flow, nor did the second producing well, Gulf Coast Realties Corporation 4. Although two subsequent wells, Gulf Coast Realties Corporation 5 and 8 came in flowing, they were put on the pump in June and December of 1948, respectively. This only oil producing field in Florida had a total of eight wells on January 1, 1949—three pumping and five flowing, as follows:

FARM: Gulf Coast Realties Corporation

No. 4—11,597 feet. Initial production 257 barrels. Pumping.

No. 5—11,578 feet. Initial production 518 barrels. Pumping.

No. 6—11,578 feet. Initial production 225 barrels. Flowing.

No. 8—11,576 feet. Initial production 527 barrels. Pumping.

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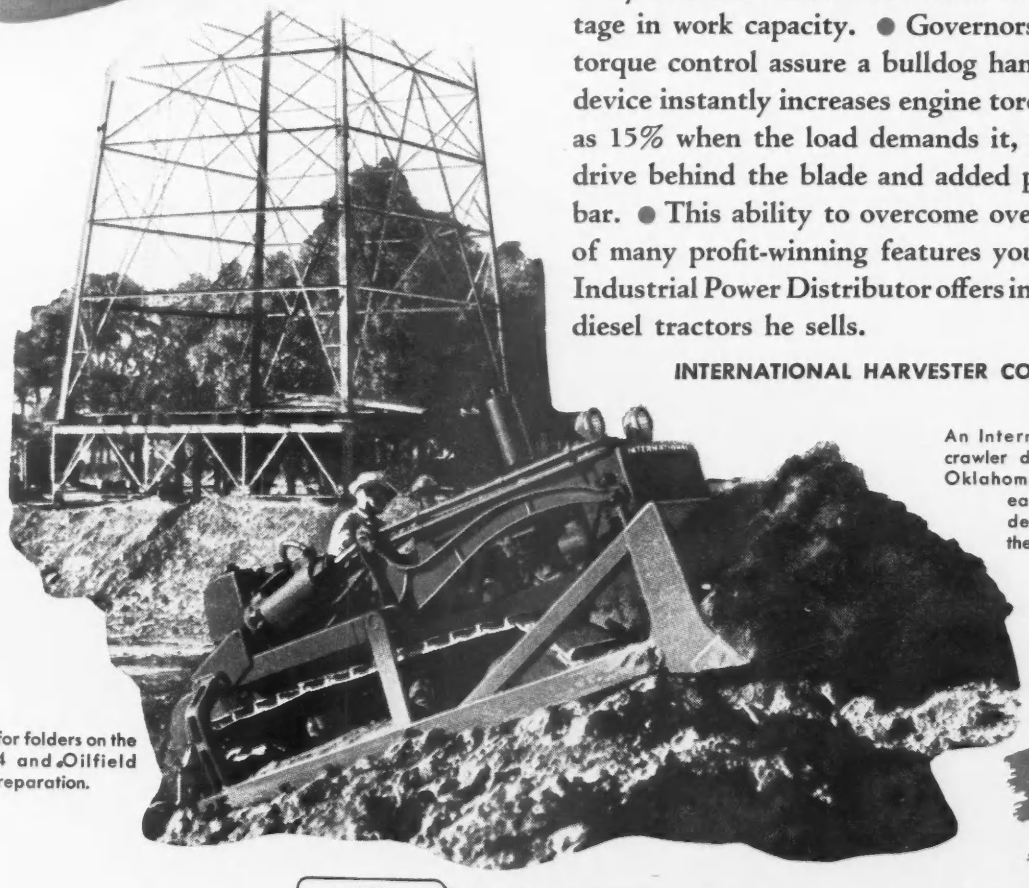

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No. 10—11,574 feet. Initial production 175 barrels. Flowing.

No. 11—11,573 feet. Initial production 120 barrels. Flowing.

No. 13—11,572½ feet. Initial production 395.37 barrels. Flowing.

FARM: Lee Tidewater Cypress Lumber Company "B"

No. 1—11,588 feet. Initial production 136.5 barrels. Flowing.

The total production of oil in Florida from its discovery, September 26, 1943, through December 31, 1948, was 650,830 barrels. Some of this oil was formerly used in drilling operations but now it is being shipped by tank car to a refinery in Charleston, S. C.

Humble Oil & Refining Company completed Lee Tidewater Cypress Lumber Company "B" 2 on March 23, 1949. This well is about four miles northwest of Sunniland and has a total depth of 11,585 feet. The initial production was 519.3 barrels per day of 26.4-gravity oil. The producing zone is at 11,564-85 feet. This is the tenth producing well in the Sunniland field, one having been abandoned because of decline in output. Currently producing are nine wells, three pumping and six flowing.

Regulatory Measures

An act to regulate and control the drilling and development of oil and gas in Florida was introduced and passed by the legislature of 1945, and received the approval of the governor on June 5, 1945. This is Chapter 22810 (No. 305) Laws of Florida 1945. This law was patterned after a model prepared under the supervision of the Interstate Oil Compact Commission with such changes as were deemed advisable after public hearings were conducted by the Attorney General and the committee from the Florida Bar Association. It has had the careful scrutiny of members of the legal department of at least two major oil companies. It is considered as good a conservation act as could be devised at the time. So far, it has proved adequate for development in Florida and appears to meet the satisfaction of all concerned. The legislature passed an act in 1947 levying a tax on oil and gas produced in Florida. This is Chapter 23883 (No. 269), Laws of Florida 1947. This act became a law without the governor's approval and was filed in the Secretary of State's office June 3, 1947.

Summary

From the information at hand it is known that through December 31, 1948, approximately 216 wells had completed as tests for oil or gas. There were on January 1, 1949, five wells incompleted and drilling, and there are at this writing some established locations that may be drilled in the future.

The wells drilled prior to 1939 were largely on general geologic evidence or on "hunches" such as the topographic and physiographic resemblance to certain oil fields elsewhere, or because of the use of some particular "oil finding" machine that in the hands of the operator would predict the occurrence of petroleum. It should be borne in mind that the accepted and credited geophysical methods do not reveal or indicate the presence of oil or gas, but provide another valuable tool in the hands of trained technicians in determining subsurface structural conditions which are favorable to the accumulation of oil.

From 1940 to the present, exploration for oil and gas has been intensively carried on by several oil companies. The methods of exploration have included not only surface geology, but also the study of samples from wells throughout the state, detailed field work within defined areas including geophysical exploration, and intensive structural drilling. In the drilling of these structural tests, the operations are carried to some well known zone, often necessitating tests of 1500 to 2000 feet deep. While statistics are not available, it is estimated that several hundred such tests have been put down by oil companies working in different areas. In addition, considerable geophysical prospecting has been completed and exploration programs are now under way. Different methods have been tried, some apparently with more satisfactory results than others. The deep drilling already accomplished has yielded information that can be interpreted with more dependability than the results of geophysical exploration. Florida's geological history is gradually being fathomed, although there are many perplexing problems still unsolved.

Data Study Required

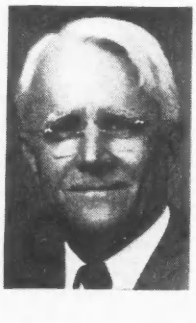
This highly creditable and excellent work by the various companies and individuals has resulted in a store of information about geological conditions in Florida that necessitates much study and time to assimilate. Some of the exploratory work resulted in conclusions immediately favorable as, for instance, the first well drilled in the Sunniland field proving production. In other areas no production has been found, but the geologic and stratigraphic data have been very helpful and revealing. That production so far has not been found outside the Sunniland field apparently has not discouraged the oil companies, for prospecting continues generally throughout the state. The Sunniland field may receive more intensive development so that the possibilities in this southern Florida region can be more completely determined.

Florida is a large state with an areal extent of about 58,000 square miles. The sum total of 216 wells is an unimpressive number for so large an area, and it is therefore no wonder that results have not been more favorable. That production will not follow continued exploratory efforts cannot be forecast and, from the activity currently going on, it must be concluded that those carrying on such explorations have a basis for them—a wildcat territory with ample thickness of sedimentary formations that could yield oil if favorable traps can be found. Testing now in progress may give some of the answers. Problems such as source beds, their position and extent, the condition of permeability and involved lithologic variations, and the usual questions of structure and stratigraphy always present in new regions have all presented themselves in Florida. The solution to these problems apparently lies in data to be revealed through more drilling.

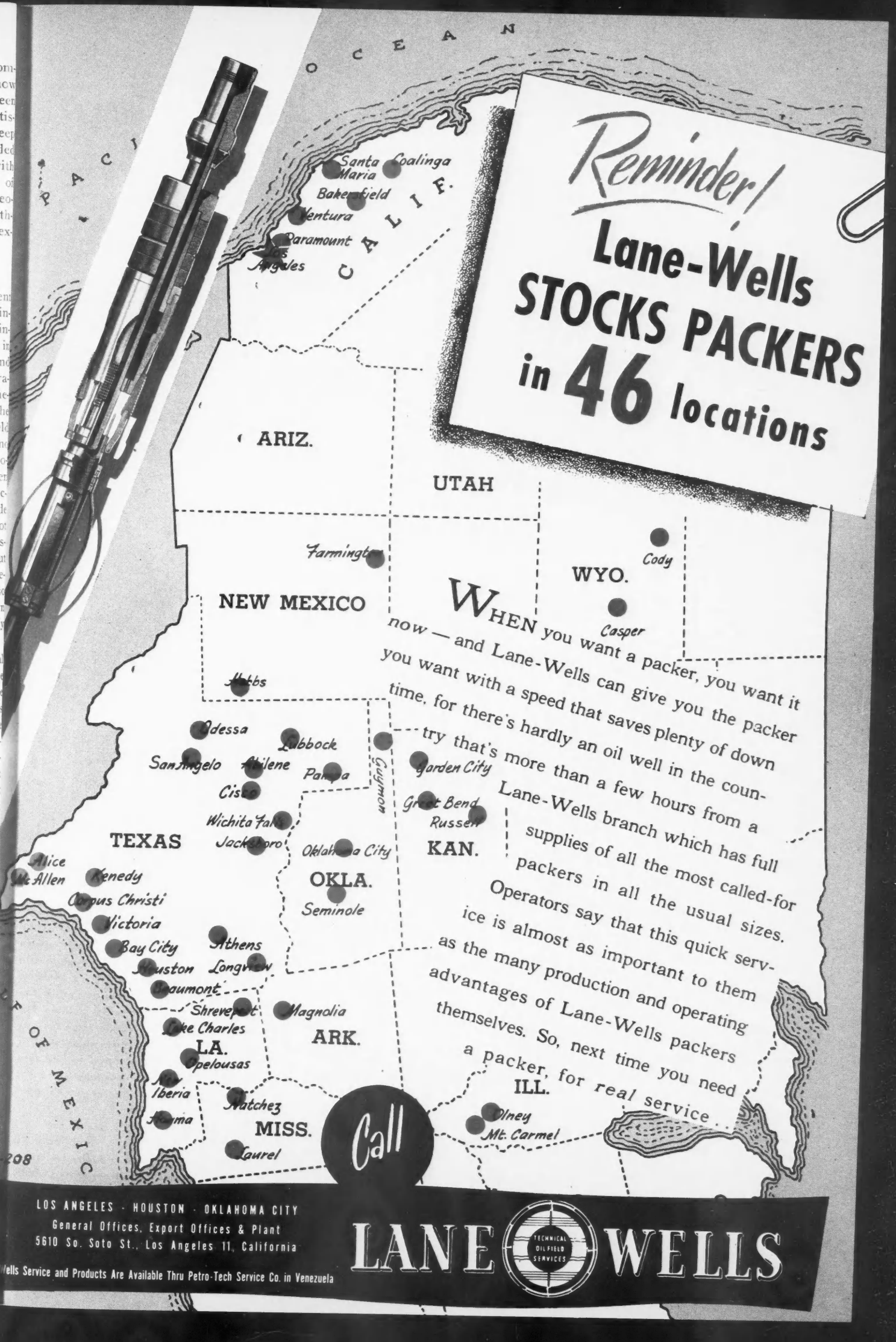
ACKNOWLEDGMENT

We wish to express appreciation and heartfelt thanks to all drilling contractors, representatives of oil companies, individual operators and others, who have so willingly and splendidly cooperated in the Survey's efforts to accumulate these data. Also, to those who have painstakingly delved into whatever original record they might have in order to help complete fragmentary information and to verify inaccurate or uncertain details, we extend thanks and acknowledge with appreciation their helpful service.

About the Author



HERMAN GUNTER has been concerned with the geology of Florida since his graduation in 1907 from the University of Florida. Shortly after receiving his Bachelor of Science degree, he joined the Florida Geological Survey. He was made State Geologist in 1919, and now is director of the Survey. He has been honored by membership in many scientific and professional organizations, serving some in executive positions. He was elected a member of the University of Florida Chapter of Phi Beta Kappa, and was awarded the degree of Doctor of Science by his Alma Mater.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New Iberia
Natchez
Laurel
Olney
Mt. Carmel
GULF OF MEXIC

Geophysicists Need to *Seek Good Will of Public*

By J. N. WILSON, Party Chief,
Seismograph Service Corporation, Tulsa

"Seismograph crews are not irresponsible drifters": Hard-working crew members slide a portable mud pit into place preparatory to drilling a hole for a dynamite shot.
All Photos Courtesy The Carter Oil Co.

ALTHOUGH the oil industry as a whole has been doing a fine job of "selling" itself to the general public, the geophysicist in the field continues to encounter serious difficulties among landowners and public officials which constitute a definite harassment to his operations. This hostile attitude is reflected in refusal to grant shooting permits, work stoppages, exorbitant permit and damage fees and other obstacles which continually plague party chiefs and crew members. It is obvious therefore, that those who come in contact with the seismograph industry have not been fully informed as to its true function and the benefits which it might bring to a community.

Frequently the geophysicist is the first oil industry representative in a given area and because of the nature of his work it would appear at first glance that he must continue to bear the brunt of public hostility since he cannot discard the cloak of professional secrecy which surrounds his activities. On the other hand, the 500-odd party chiefs and their associates now engaged in seismic work in these United States, can constitute a spearhead which can contribute in large measure to the continued success of the industry's public relations program. However, this can only be achieved by the initiation on the part of the seismograph companies, of an intelligent public relations program of their own, designed to reveal certain basic facts surrounding seismic exploration work without divulging any "trade secrets."

It is significant that the same inimical attitude towards seismograph parties on the part of the landowners and public officials is encountered in areas which have been shot many times as well as in areas where a relatively small amount of seismic exploration has been undertaken. The conclusion to be drawn from this situation is that the need for educating the public concerning the nature of seismic work and of the men engaged in it, is very necessary and should be nation-wide in scope. All seismograph companies should take an active part in this educational program if they are to break down the barriers of hostility and prejudice which impede efficient and economical seismic work in the field.

Obviously, such a program should be primarily concerned with ways and means of educating the public in areas where seismic exploration is being undertaken, as to the real meaning of the work. It should endeavor to create a feeling of confidence and friendship between the geophysical crews and the landowners and public officials by conveying the following ideas in a conservative but effective manner:

1. That the seismograph industry is a highly respectable and very necessary part of the petroleum industry and that it is not in business for the purpose of defrauding the landowner.

2. That, apart from the actual results obtained in seismic exploration, the geophysicist has nothing to hide and is always willing to explain in simple and "down-to-earth" terms the functions and purpose of his science.

3. That the benefits which a community may derive from seismograph explorations are substantial, such as (a) current benefits resulting from crew payroll and business for local merchants; (b) near-term benefits represented by lease payments; (c) long-term benefits which may accrue in the way of royalty payments and permanent oil field payroll.

4. That an intelligent effort should be made to temper undue optimism and pessimism which usually accompany oil plays, particularly in rank wildcat

GEOPHYSICAL PARTIES frequently are the first oil industry representatives in an area, and the impression they make upon the public means gaining or failing to win good will for themselves and the oil industry.

Geophysical parties sometime experience difficulties in gaining the good will and cooperation of the public, partly because their work is unfamiliar and strange to the layman, and partly because some secrecy necessarily surrounds geophysical activities.

To break down suspicion and hostility toward them and promote good will instead, geophysical companies need to initiate active public relations programs.

DERRICKS & DOLLARS

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and/or marginal areas. The longterm aspects of oil exploration should be made clear and landowners should be told frankly that a dry hole does not necessarily condemn the prospect.

5. That seismic exploration is by no means a "cut-and-dried" method for discovering oil and that in fact the science does not "discover" oil at all, but is a tool used in locating favorable structure and subsurface conditions so that as much of the gamble as possible may be eliminated in actual drilling. Explain that many pools have been discovered after an area has been seismographed many times. Also emphasize that oil companies will not carry out extensive leasing programs until they have shot an area. The farmer or landowner would be the first to realize the soundness of this policy since he would not care to buy a "pig in a poke" nor would he expect an oil company to invest large sums of money without first using all available means to assure itself that the investment has a reasonable chance of paying out.

6. That the public be informed, and especially landowners on whose lands the geophysical crews are operating, that the geophysicist is an expert in the handling of explosives and that every possible precaution is taken during shooting operations to protect public property.

7. That there is a real and sound reason for the secrecy which surrounds the results of seismograph exploration, emphasizing particularly the competitive nature of the oil business.

8. That the seismograph is a highly developed tool essential in the oil industry's efforts to discover more oil so that neither the farmer nor the city dweller may ever experience a serious shortage. Party chiefs and other crew members should explain that although critical shortages of petroleum products have not yet materialized, the depletion of reserves caused by the war as well as an unprecedented postwar demand for petroleum products make it imperative that the nation's crude oil reserves be increased.

9. Finally, that seismograph crews are not irresponsible drifters, but honest and respectable people engaged in making a livelihood in an interesting profession in which they take pride.

In order to get the above points across the geophysical parties in the field should resort to close personal contacts with landowners and public officials, while the seismograph companies might avail themselves of the medium of paid advertising which has been so effective in the industry's overall public relations program.

Paid advertisements embodying and expanding the points already covered could be carried in newspapers and publications serving the area of operations. Crew members should be instructed to be friendly and considerate of reporters seeking a "story" and the party chief should endeavor to give all information possible consistent with company policy and without revealing confidential information. The reporter can be a powerful ally in dispelling misconceptions and presenting the seismograph industry in a good light.

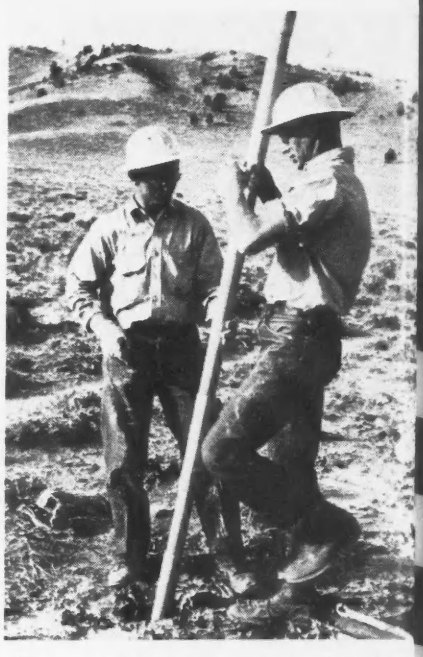
The showing of movies dealing with seismograph operations should be encouraged and made available to local civic groups such as Chambers of Commerce, schools and service clubs. Party chiefs can play a vital public relations role by sponsoring such showings and making brief talks before interested groups.

In the field of personal contacts party chiefs should be instructed to utilize every opportunity to make friends for their company in the areas in which they are working. Seismograph companies should provide party chiefs with personal calling cards such as are used by other executive personnel. Such cards would be most useful when a crew moves into a new area and represent a dignified means of identification.

It goes without saying that all crew members should be courteous, diplomatic and tactful at all times in their dealings with the public and all interested parties.

Seismograph companies could prepare small, inexpensive leaflets which tell their story, and these could be distributed by crew members. Leaflets should display prominently the name of the company and be provided with a blank space for the inclusion of the local field office address. A supply of such leaflets should be kept in the field office and in the trucks at all times. Surveyors would give them to individuals with whom they come into contact when seeking a permit; the observer and driller could hand them out to interested parties watching the drilling and recording crews in action. The leaflets could also be mailed to all rural boxholders in the area being shot.

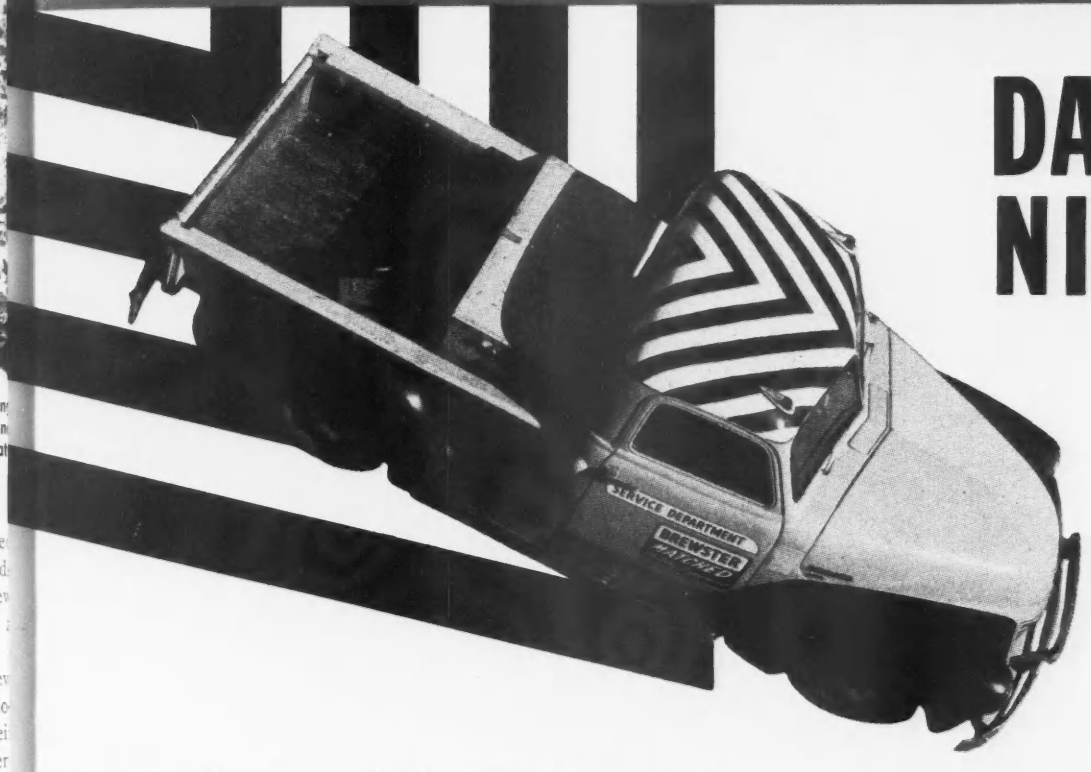
The above suggestions and the means for bringing the facts before the public should prove effective in promoting good public relations between the geophysicist, the seismograph companies and the public. The program is highly flexible and could be implemented in many ways. A concerted effort by the various geophysical chapters, working in conjunction with the geophysical companies will realize the objectives herein discussed and contribute to the success of the industry's public relations program.



"The geophysicist is an expert in the handling of explosives": 25 pounds of dynamite in one long charge with cap and detonating wires attached is lowered into a shot hole.

"Respect for public property": Members of a seismograph shooting crew plug a shot hole with dirt and rocks to prevent a mishap to livestock.

SERVICE STRIPES... TO REMEMBER



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Exploration

14.3 Percent Above 1948 Period

EXPLORATORY work has provided the difference between this year's overall drilling campaign and last year's record-breaking activity. At the end of seven months, all wells completed in the U. S. amounted to 512 more than those of a year ago for a slim lead of little more than 2 percent. For the same period, exploratory well completions topped last year's by 533—a 14.3 percent gain—to account for the entire margin of increase.

If it were not for the stepped-up exploration, this year's completions would be lagging behind the 1948 record for the drilling of development or field wells has not been quite able to keep pace. One of the main reasons exploratory drilling has not been cut back proportionately with development work is that drastic cuts have been made in the Appalachian Region where wildcatting plays a small role.

Whether 1949 will replace last year as the top wildcatting year of all-time remains to be seen. While it now holds a comfortable lead, the margin has been whittled in the past several months and will perhaps continue to be cut as more and more rigs are shelved.

Summary of Results of Exploratory Drilling

ITEM	July, 1949	June, 1949	SEVEN MONTHS: January-July 1949	1948	Percent Diff.
Oil Discoveries	88	108	585	492	+ 18.9
New Fields	67	68	401	311	+ 28.9
New Pays	21	40	184	181	+ 1.7
Distillate Discoveries	11	13	88	56	+ 57.1
New Fields	5	3	43	29	+ 48.3
New Pays	6	10	45	27	+ 66.7
Gas Discoveries	12	16	81	74	+ 9.5
New Fields	11	14	67	53	+ 26.4
New Pays	1	2	14	21	— 33.3
Total Discoveries	111	137	754	622	+ 21.2
Extensions to Fields	19	26	152	122	+ 24.6
Oil Fields	18	22	136	102	+ 33.3
Distillate Fields	.....	3	6	8	— 25.0
Gas Fields	1	1	10	12	— 16.7
Total Prod. Tests	130	163	906	744	+ 21.8
Dry Holes	512	519	3343	2972	+ 12.5
Wildcats	501	510	3298	2929	+ 12.6
New Pays	5	.....	7	7	.....
Outposts	6	9	38	36	+ 5.6
Total Expl'tory Tests	642	682	4249	3716	+ 14.3
Percent Productive	20.2	23.9	21.3	20.0	.....
Percent Dry	79.8	76.1	78.7	80.0	.....

(See tables on Pages 80, 82, 84.)

Results of Exploratory Drilling in July and First 7 Months, 1949-1948, by Districts

State or District	MONTH OF JULY, 1949													FIRST SEVEN MONTHS, 1949																			
	Productive Tests									Total Productive	Unproductive Tests			Total Exploratory Tests	Productive Tests								Total Productive	Unproductive Tests			Total Dry		Total Exploratory Tests	
	New Fields			New Pays			Extensions				Wildcats	New Pays	Outposts		New Fields			New Pays			Extensions											
	Oil	Dis.	Gas	Oil	Dis.	Gas	Oil	Dis.	Gas						Oil	Dis.	Gas	Oil	Dis.	Gas	Oil	Dis.	Gas	7 Mo. 1949	7 Mo. 1948			7 Mo. 1949	7 Mo. 1948	7 Mo. 1948	7 Mo. 1949
Alabama											4			4												10			10	11	10	
Arizona											1			1												4	1		4	1	4	
Arkansas	2			1			1			4	6	1	1	12	5		1	3			1			10	4	34	1	2	37	56	47	
California	2						2		1	5	31	3		39	8		2	8			11		2	31	33	191	3	1	195	140	226	17
Colorado											3			3											1	23		1	24	30	24	
Florida											1			1												9			9	13	9	
Georgia																										4			4	2	4	
Illinois	6			4			3			13	67			80	13			18			28			59	59	308			308	273	367	3
Indiana	4									4	27			31	26			3			4			33	26	215			215	136	248	1
Kansas	5		1				2			8	42			50	40		4	4			5			53	44	229			229	258	282	3
Kentucky	1						1			2	6			8	7						1			8	7	26			26	29	34	
Louisiana	2	3		5	1					11	23			34	17	10	4	21	13	1	4	1		71	71	137			137	132	208	2
North Louisiana	2	1								3	13			16	5	4	1	1	7					18	14	71			71	66	89	
South Louisiana		2		5	1					8	10			18	12	6	3	20	6	1	4	1		53	57	66			66	66	119	1
Maryland																														1		
Michigan											17			17	12		1				5			18	12	175		1	176	134	194	1
Mississippi	1									1	8			9	4			2						6	3	64		2	66	48	72	
Missouri											4			4												5			5	7	5	
Montana	2	1					1			4	7			11	3	1					1			5	4	18		1	19	17	24	
Nebraska											1			1	1									1		2			2		3	
New Mexico	1									1				1	8			3						11	13	30			30	38	41	
Ohio											2			2							2		1	3	10	21			21	21	24	
Oklahoma	4			2			2			8	39			47	33	2	4	10	1	2	16			68	66	257			257	276	325	3
Pennsylvania																	1							1		1			1	3	2	
South Dakota											1			1												2			2	1	2	
Tennessee															1									1	1	10			10	21	11	
Texas	36	1	9	9	5	1	6			67	201	1	5	274	214	30	45	103	31	11	52	9	3	498	360	1449	3	27	1479	1277	1977	16
Dist. 1 S. Central											18			18	9			1			1			11	3	138		1	139	109	150	1
Dist. 2 Middle Gulf		1			3					4	16			20	4	12	7	5	8	3	1	3	1	44	43	93		4	97	117	141	1
Dist. 3 Upper Gulf	4		3	4						11	16			27	14	10	5	34	11	2	4	3		83	61	143			143	152	226	2
Dist. 4 L. Gulf-SW	1		4	3	2	1				11	27			38	9	5	13	28	10	6	1	1		73	57	212	1	6	219	199	292	2
Dist. 5 E. Central	1									1	6			7	2	1						1		4	7	43			43	42	47	
Dist. 6 Northeast	2									2	7	1		10	6	2	2	1	2			1	1	15	13	40	1		41	39	56	
Dist. 7-B N. Central	12		1	2			1			16	42		1	59	77		12	14			5			108	66	329	1	2	332	223	440	2
Dist. 7-C W. Central	3		1				2			6	9		1	16	10		3	3			6			22	13	55		2	57	57	79	
Dist. 8 West	4						2			6	12			18	25			5			22		1	53	52	111		3	114	103	167	1
Dist. 9 North	9						1			10	47		3	60	57		3	12			12			84	45	281		9	290	234	374	2
Dist. 10 Panhandle											1			1	1									1		4			4	2	5	
Utah	1									1	2			3	2						1			3	2	8			8	11	11	
Virginia																									1							
Washington																														2		
West Virginia			1							1				1				5						5	2	1			1		6	
Wyoming											8			8	7			9			5			21	25	65		3	68	34	89	
Total U.S.	67	5	11	21	6	1	18		1	130	501	5	6	642	401	43	67	184	45	14	136	10	6	906	744	3298	7	38	3343	2972	4249	37

● In the course of his experiments, Charles Goodyear, the great American scientist, dropped a piece of sulphur-cured India rubber on a red hot stove. Rubber, untreated with sulphur, would have melted instantly, but this piece was only slightly charred. By careful analysis of these results, Mr. Goodyear discovered vulcanization.

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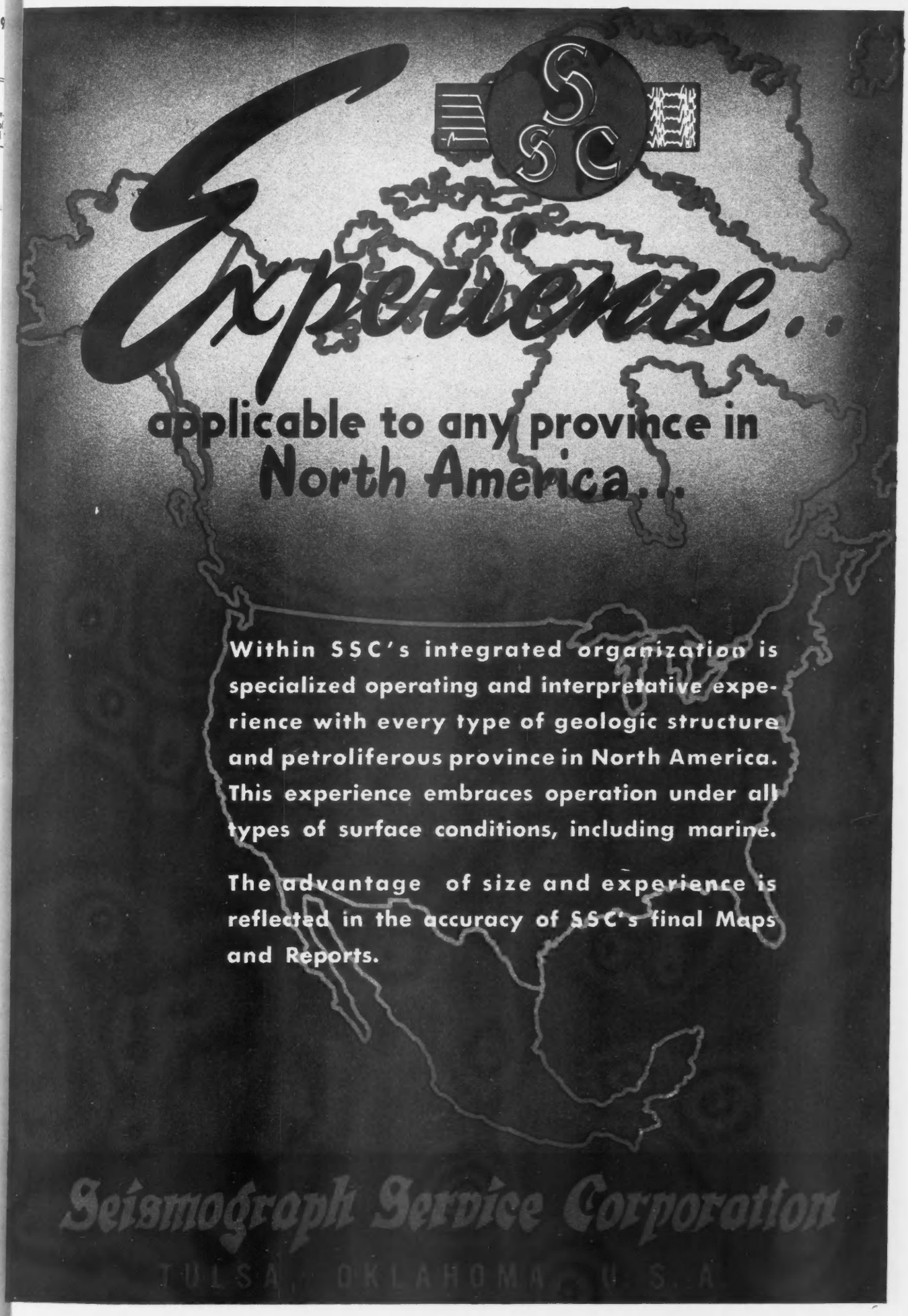
New Oil, Distillate and Gas Fields and New Pay Horizons Discovered in the United States in July, 1949

Also Important Extensions to Established Fields

COUNTY	FIELD	COMPANY, WELL AND LOCATION	Date Completed	Total Depth (Feet)	Completion Horizon (Feet)	[1]Name, Character and Age of Producing Formation	[2]Initial Production Method and Choke	Gravity of Oil
		ARKANSAS—New Oil Fields						
Columbia	Spotville	McAlester Fuel Co. & Curtis Kinard's T. O. Giles Est. 1-A, 735 fr nl 660 fr fr wl NE 6-18s-18w, 1½ mi e Spotville.	7- 5-49	7876	7766- 7771	Smackover li; Jur	F 78; 5 wtr; 11/64"	45
Ouachita	"Curry"	Burnett Drilling Co's Kate Curry 1, 150 fr wl 330 fr sl 5-15s-19w, 2½ mi n Stephens fld.	7-16-49	4483	3608- 3620	Travis Peak sd; L Cre	F 432; ¼"	33
		ARKANSAS—New Oil Pay						
Columbia	Village	C. W. Williams, R. T. Sellars & Wilson Ewing's J. G. Alexander 1, 660 fr sl 460 fr el sw se 8-17s-19w.	7-11-49	4830	3988- 4002	L Glen Rose sd; L Cre	F 144; 5/32"	32
		ARKANSAS—Oil Field Extension						
Columbia	Wesson	Floyd P. Wilson et al's Hunter Hodge 1, c sw sw 9-16s-19w, 2 mi s extension	6-24-49	3520	3490- 3520	Hogg sd· L Cre	P 18	
		CALIFORNIA—New Oil Fields						
Fresno		Elmer C. Von Glahn's Oceanside 4, 1998 s 397 e fr nwc 33-22s-16e, Kreyenhagen Hills area.	7-19-49	408	400- 408		P 4	
Monterey	Monroe Swell	The Texas Co's Beedy NCT-2-1, 654 n 2000 e fr swc 19-19s-7e, 8 mi nw King City.	6-29-49	3300	2392- 2435		P 13	17.8
		CALIFORNIA—Oil Field Extensions						
Kern	Fruitvale	Alexander M. Campbell & Joseph C. Shell's Kern-Land 1, 330 n&e fr swc 26-29s-27e, se extension.	7-18-49	4258	3986- 4258	Middle Kernco sd; Mio	F 182; ¼"	17
Santa Barbara	Cuyama, S.	Richfield oil Corp's Perkins 17-31, 985 n 344 e fr swc 21-10n-26w, 1¼ mi se extension.	7-23-49	4360	3951- 4358	Homan sd; Mio	F 4446; 650 wtr; ½"	33.5
		CALIFORNIA—Gas Field Extension						
Yolo	Pleasant Crk.	Shell Oil Co. & Natural Gas Co's Pleasant Creek Unit 4-1, 3245 n 900 e fr swc 8-8n-1w, ½ mi n extension.	6-29-49	2859	2712- 2750	Middle Eocene	F 9.9 mln	
		ILLINOIS—New Oil Fields						
Franklin	Taylor Hill	Producers Pipe Line Co's King 1, NW NE SW 16-5s-4e, 6 mi e Whittington fld.	7-26-49	3063	3056- 3062	L O'Hara li; Miss	P 154	
Hamilton	Rural Hill, N.	Gulf Oil Corp's J. Russ 1, SW NE SW 35-5s-5e, 2 mi nw Rural Hill pl.	7-19-49	3468	3324- 3330	Rosiclare li; Miss	P 22; 70 wtr.	
Jefferson	North Ina	Dunbar Drilling Co's Wilson 1, NE NE SW 20-4s-3e, 2 mi e Ina pl.	7-19-49	2977	2941- 2945	McClosky li; Miss	P 30; 7 wtr.	
Marion	Raccoon Lake.	The Texas Co's Franke-Meyer Unit 1, NE SW SE 3-1n-1e, betw Salem and Centralia fids.	7-19-49	2067	1924- 1934 1951- 1971	Rosiclare sd; Miss McClosky li; Miss	P 214	
Wayne	Zenith, S.	Ill. Mid-Continent Co. & Aurora Gasoline Co's Richardson 1, NW NE SW 9-1n-5e, 3 mi sw Zenith fld.	7-19-49	3092	2994- 2996	McClosky li; Miss	F 675	
White	Dead River	C. E. Skiles' McAllister 1, 1500 fr nl 3252 fr wl Sect. 7-7s-11e, 1¾ mi n New Haven pl.	7-19-49	2486	2475- 2486	Cypress sd; Miss	P 45	
		ILLINOIS—New Oil Pays						
Gallatin	Inman, Cent.	S. A. Gilpin's Jos. Fromm 1, SE NE NW 6-8s-10e	7- 5-49	2790	2770- 2789	Aux Vases sd; Miss	P 150	
Jasper	Clay City-Noble Cons.	F. Lomelino et al's Ochs 1, C NW NE 27-6n-10e, 1½ mi fr prod.	7-19-49	4515	2935- 2953 4396- 4404	St. Louis li; Miss Devonian li; Devo	P 53; 7 wtr	
Wayne	Fairfield	Stewart Oil Co's Bothwell 2, NE NW NW 20-2s-8e	7- 5-49	3381	2932- 2948	Cypress sd; Miss	P 294	
White	New Haven, N.	Sohio Petroleum Corp's Pearce 3-B, NE NE NE 3-7s-10e	7-26-49	2966	2961- 2963	McClosky li; Miss	P 106	
		ILLINOIS—Oil Field Extensions						
Christian	Assumption, N.	H. R. Lippitt's R. E. Cramer 1, NE NW SW 15-13n-1e, ½ mi se extension	7-19-49	2331	2322- 2331	Devonian li; Devo.	P 282	
Gallatin	Inman N&W Cons.	C. E. Skiles' S. E. Abell 1, NW SE SW 14-8s-9e, consolidating well	7-19-49	2517	2510- 2515	Cypress sd; Miss	P 62	
Wabash	Maud Cons.	Geo. S. Engle's Steckler 2, C SE NW 24-1s-13w, ½ mi e extension	7-26-49	2265	2235- 2258	Cypress sd; Miss	P 7; 10 wtr	
		INDIANA—New Oil Fields						
Gibson		Ashland-Buchman-O'Neal's C. R. Barrett 1, SW SE NE 7-3s-11w, 1½ mi ne Mounts pl.	7-26-49	2111	2099- 2111	U Cypress sd; Miss	P 72	
Gibson		Winmar Oil Co's Henry White 1, SW NE SW 29-1s-10w, 1 mi se Patoka, E. pl.	7-19-49	1690	1673- 1690	Cypress sd; Miss	P 59; 7 wtr	
Knox		Winmar Oil Co's F. Parkinson 1, NE NE NW 11-1s-12w, 1½ mi e Mt. Carmel pl. (Ill.).	7-31-49	2269	2262- 2269	L O'Hara li; Miss	P 120	
Vigo		Gilliam Drlg Co & Warren Usrey's C. B. Huntwork 1, NW NW SE 20-10n-8w, 2 mi fr prod.	7-27-49	1984	1855- 1879	Devonian li; Devo	P 100	
		KANSAS—New Oil Fields						
Ellis	Chrisler	J. M. Huber Corp. & Crowe Drlg Co's Chrisler 1, NW NW SW 22-11s-16w, 2 mi e Bemis-Shutts fld.	7-19-49	3460	3100- 3112	Lansing-K.C. li; Penn	P 54; 72 wtr	
Pawnee	Larned	Sunray Oil Corp's Brown 1, NE NE SW 28-21s-16w, 3½ mi sw Ash Creek, SW fld.	7- 6-49	3887	3878- 3879	Arbuckle li; Ord	P 40; 4.5 mln	38
Rooks	Berland, NE.	Sunray Oil Corp. & Heathman-Honaker Drlg Co's Richardson 1, NW NW NW 17-10s-19w, ¾ mi e Berland pl.	7- 6-49	3772	3768- 3772	Arbuckle li; Ord	P 267	28
Russell		Lindas Oil Co. & Murfin Drlg. Co's Ehrlich 1-B, SE SE NW 17-14s-13w, ½ mi n&e Hall-Gurney fld.	7-21-49	2439	2395- 2439	Tarkio li; Penn	P 90	
Stafford	Silver Bell.	Ferrell Drlg Co's Hahn 1, NW NW SW 10-22s-13w, 1 mi nw Kenilworth pl.	7-30-49	3786	3733- 3773	Arbuckle li; Ord	P 408	
		KANSAS—Oil Field Extensions						
Rice	Chase	Henderson Oil Co's Proffitt 1, SW SW NW 13-20s-10w, ¾ mi w extension	7- 6-49	3345	3339- 3345	Arbuckle li; Ord	P 62; 10 wtr	
Rooks	Berland	Glen Nye's Sutor 1, SE SE SW 13-10s-20w, ½ mi w extension	7-19-49	3748	3744- 3748	Arbuckle li; Ord	P 100	
		KANSAS—New Gas Field						
Harvey		Drillers Gas Co's Warkentin 1, SE SE NW 16-23s-3w, 1 mi e Burrton pl.	7-14-49	3372	3304- 3319	Mississippi li; Miss	F 6 mln	
		KENTUCKY—New Oil Field						
Daviess		Wasson Oil Co's Hugh H. Goodwin 1, C N½ SW NE 17-N-2S, 2 mi se Guffie, E. fld.	7-26-49	1895	1891- 1895	McClosky li; Miss	P 115	
		KENTUCKY—Oil Field Extension						
Henderson	Birk City	W. E. Hupp & W. Chenault et al's J. J. Spencer 1, SE NW SE 17-P-27, w extension.	7-29-49	1272	1266- 1272	Tar Springs sd; Miss	P 15	
		NORTH LOUISIANA—New Oil Fields						
Bossier	Bossier City	McAlester Fuel Co. et al's Waller Est. 1-A, 668 fr wl 660 fr sl 27-18n-13w, 2¾ mi e Shreveport fld.	7-14-49	5585	5555- 5564	Pettit li; L Cre	F 72; ¼"	43.4
La Salle	Catahoula Lake, N.	Justiss-Mears Oil Co's J. E. Harris 1, C NW NW 2-6n-3e	7-21-49	5357	4008- 4018	Wilcox sd; Eoc	F 112	44
		NORTH LOUISIANA—New Distillate Field						
Union		Southwest Gas Prod. Co's W. C. Feazel-J. F. Weldon 1, 200 fr sl 500 fr el NE 24-21n-3w, 3 mi s & 2½ mi e Bernice.	7-18-49	9087	7806- 7810	Bodcaw sd; Jur	F 30; 30 wtr; 2.8 mln; ¼"	
		SOUTH LOUISIANA—New Oil Pays						
Calcasieu	Iowa	Magnolia Pet. Co's Bowman 1, 2041.2 n 2310.6 e of SWC 11-9s-8w	7-19-49	11800	10202-10207		F 110; 5/32"	45.
Iberia	Weeks Island	Humble O&R Co's J. M. Burguires Co., Ltd 5-B, Sect 44-14s-7e, se flk	7-11-49	7547	5775- 5780		F 227; 3/11"	25.5
Iberia	Weeks Island	Shell Oil Co. Inc's Smith-State Unit "C" 2, Sect 18-14s-7e	7- 2-49	13839	13728-13743		F 378; 2/4"	34
Plaquemines	Pointe a la Hache	Sid W. Richardson's Humble-Delacroix State 1212-10E, 729.46 fr wl 1359.41 fr nl Sect 34-16s-14e.	7-27-49	11185	8838- 8842		F 93; 2/4"	34.6
Terrebonne	Ship Shoal Blk 32	Kerr McGee Oil Industries, Inc's St. Lse 752 4-B, Sur loc. Blk 33, Bottom loc. Blk 30, Gulf of Mexico.	7-15-49	3495	3168- 3183		P 120	30.1

[1] Character of producing formations abbreviated thus: ch, chalk; dolo, dolomite; li, limestone; sd, sandstone; sh, shale; ser, serpentine; cgl, conglomerate. Ages of formation abbreviated thus: Plio, Pliocene; Mio, Miocene; Olig, Oligocene; Eoc, Eocene; U. Cre, Upper Cretaceous; L. Cre, Lower Cretaceous; Jur, Jurassic; Tri, Triassic; Perm, Permian; Penn, Pennsylvanian; U. Miss, Upper Mississippian; L. Miss, Lower Mississippian; Devo, Devonian; Sil, Silurian; Ord, Ordovician; Cam, Cambrian.

[2] Barrels of oil per day (24 hour rate), flowing (F), pumping (P), swabbing (Sw), or bailing (B); or million cubic feet of gas daily open flow capacity; size of choke given in inches.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New Oil, Distillate and Gas Fields and New Pay Horizons Discovered in the United States in July, 194

Also Important Extensions to Established Fields

(CONTINUED)

COUNTY	FIELD	COMPANY, WELL AND LOCATION	Date Completed	Total Depth (Feet)	Completion Horizon (Feet)	[1]Name, Character and Age of Producing Formation	[2]Initial Production Method and Choke	Gravity Oil
		SOUTH LOUISIANA—New Distillate Fields						
Iberville	.....	Callery & Hurt & Phillips Pet. Co's Repp 1, 499.3 n 319.3 w fr SEC Sect 79-9s-11e.	7-22-49	11300	10809-10827	.....	F 414; 1.7 mln; 13/32"	51
Terrebonne	"Ship Shoal Blk 28"	Kerr-McGee Oil Industries, Inc's State Lse 750-1 Blk 28, 7½ mi in Gulf of Mexico.	7-29-49	14671	8482- 8490	.....	F 69; 3.5 mln. ¼"	5
		SOUTH LOUISIANA—New Distillate Pay						
St. Martin	Duck Lake	Hunt Oil Co. et al's St. Lse 1392-Goodrich Unit 1-1, 4620 s 660 w of NEC 2-15s-11e.	7-16-49	13595	12404-12407	.....	No gge; 6 mln	
		MISSISSIPPI—New Oil Field						
Lincoln	"Midway"	Big Chief Drlg Co & W. B. Osborn's Mrs. George Zeigler 1, C NW NW 2-6n-7e, 2½ mi nw Mallalieu fld.	7-22-49	10660	10552-10570	Tuscaloosa sd; U Cre	F 356; ¼"	37
		MONTANA—New Oil Fields						
Carbon	.....	J. C. Shupak et al's Parker 1, SW SW SE 13-7s-23e, Jack Creek area	6- 8-49	530	506- 530	Dakota sd; U Cre	P 25; 100 wtr	39
Toole	.....	Hesla Oil Co's Negu 1, S½ NE NW 12-34n-4w, 4¾ mi sw Kevin-Sunburst fld.	7- 7-49	1865	1861- 1865	Ellis-Madison li; Miss	P 22; 50 wtr	38
		MONTANA—Oil Field Extension						
Pondera	Cut Bank	Hagerty Oil Co's Tribal 431-1, SW SW SE 4-31n-5w, s extension	7-17-49	2991	2986- 2991	Madison li; Miss	P 15	
		MONTANA—New Distillate Field						
Carbon	.....	British-American Oil Prcd Co's McClellan-Gov't. 1, C NE NE 26-9s-22e, Clark's Fork area.	7-11-49	9446	7548- 7560	Dakota sd; U Cre	F 31; 2.2 mln	57
		NEW MEXICO—New Oil Field						
Eddy	.....	Amerada Pet. Corp's State 1-BTA, NW SE 2-12s-33e, 12 mi ne Caprock fld.	7-16-49	11766	10950-10965	Devonian li; Devo	F 1744; ½"	44
		OKLAHOMA—New Oil Fields						
Cleveland	Lexington, NE	Teepee Drilling Co's Isador J. Warner 1, C SE NE 4-6n-1w	7- 7-49	6655	6553- 6563	Unconformity sd; Penn	P 36	46
Comanche	.....	Bond Oil Co's Choens 1, SW SW SE SW 31-4n-10w	7-14-49	1002	549- 742	Permian sd; Perm	F 8; ¼"	34
Garvin	.....	Howell & Howell's J. S. Webster 1, (OWDD), SE SE NW 5-3n-2e	7-30-49	3552	3140- 3160	.....	P 2; 16 wtr	
Seminole	.....	Paul J. McIntyre's Rosana Harjo 1, NE SE NW 35-9n-7e, 1 mi n Wewoka Lake pl.	6-16-49	3445	3317- 3334	Booch sd; Penn	P 20; 10 wtr	
		OKLAHOMA—New Oil Pays						
Hughes	Alabama, SW.	Frank B. Murta et al's Ida Ellis 2, (OWWO), NW NW SE 6-9n-11e	7-30-49	4050	3734- 3736	Hunton li; Devo	P 15; 40 wtr	41
Stephens	Sholem Alechem, W.	Davon Oil Co's Rue 2, NW NW SE 22-1s-4w	7- 6-49	4841	4836- 4841	Deese sd; Penn	P 15	17
		OKLAHOMA—Oil Field Extensions						
Lincoln	Midlothian, NW.	F. A. Gillespie & Sons' O. Taylor 1, SE SE SW 26-14n-3e, ½ mi s extension	7-14-49	5288	4134- 4154	Prue sd; Penn	F 17; 10 wtr; 2 mln	48
Washita	Elk City	E. Constantin, Jr.'s Lambert 1, C SW SW 18-10n-20w, 1¾ mi e extension	7-21-49	10417	9849- 9854	Granite Wash; Penn	F 1198; 2.8 mln; ½"	52
		TEXAS—District 2 (MIDDLE GULF)—New Distillate Field						
Live Oak	.....	Argo Oil Corp's Schulz Live Stock Co. 1, 660 fr el 4500 fr nl John Heffernan Sur, 5½ mi n Three Rivers.	6-15-49	9500	8314- 8340	Wilcox sd; Eoc	F 9; 0.1 mln; ⅛"	49
		TEXAS—District 2 (MIDDLE GULF)—New Distillate Pays						
Goliad	Wessatche, W.	W. L. Goldston's Elsie Landgrebe 1, 1950 fr wl 1650 fr sl M. J. Carico Sur.	6-27-49	8150	8060- 8075	.....	No gge	
Live Oak	Clayton	Western Natural Gas Co's C. S. Herring et al 1, 640 fr nel 450 fr nwl D. R. Fant Sur 248, ½ mi n-ne prod.	6-12-49	7020	6490- 6499	Slick sd; Eoc	F 821; 60 mln; open	50
Refugio	La Rosa, N.	Phillips Pet. Co's S. Bill 1 (OWWO), 660 fr el 330 fr sl N½ SE Sect 40, Johnson & Pugh Sbdn of Bonnie View Rch.	6-11-49	9203	5722- 5732	.....	F 20; 20 mln; open	
		TEXAS—District 3 (UPPER GULF)—New Oil Fields						
Brazoria	Collins Lake	McCarthy O&G Corp's R. F. Willy 1, 200-ac Lse C. Smith Lge, 4 mi sw Angleton, s of Blue Lake fld.	7-22-49	12220	9182- 9190 9852- 9856	.....	F 322; 11/64" No gge (gas)	33
Liberty	.....	L. M. Josey et al's A. W. Abshire et al 1, 400 fr s&el 20.66-ac Lse, M. G. White Lge, 1½ mi nw of S. Liberty fld.	7-27-49	8037	6802- 6809	Yegua sd; Eoc	F 188; 1/4"	38
San Jacinto	.....	Butcher-Arthur's Coline Oil Corp. 3-A, 330 fr nl 8000 fr el Jas. Rankin, Jr. Sur, 5 mi sw Cold Springs.	7-27-49	4531	4384- 4388	Cockfield-Yegua sd; Eoc	F 66; 3/32"	42
Wharton	.....	C. C. Gilger's J. W. Prasifka 1, 330 fr nl 660 fr el 154.1-ac Lse, GWT&P Sur, 2 mi s Lane City.	7-22-49	5621	5548- 5554	.....	F 175; 1/32"	24
		TEXAS—District 3 (UPPER GULF)—New Oil Pays						
Harris	Humble	Riley A. Gwynn's A. W. Wagner 1, 40 fr n&wl E. Ruhl Sur, on s flk	5- 9-49	4517	3652- 3660	.....	F 128; open	41
Liberty	Hull	John W. Mecom's State of Tex. 1, 150.7 fr wl 100 fr sl W. L. Thomas Sur, nw flk.	7-27-49	9214	7676- 7696	.....	F 176; 1/8"	38
Madison	Madisonville, W.	J. M. West's R. B. Magness 1, 3550 fr wl 4450 fr sl Amy Boatright Sur	7-18-49	9736	9110- 9118	.....	F 38; 3/8"	46
Tyler	Hillister, E.	Humble O&R Co's Wm. Rice Institute 3, 660 fr nl 1880 fr wl 1440-ac Lse, A. Hutchins Sur.	7- 4-49	4961	4946- 4949	Cockfield sd; Eoc	F 81; 1/8"	37
		TEXAS—District 3 (UPPER GULF)—New Gas Fields						
Jefferson	Big Hill, N.	McCarthy O&G Corp's Rev. C. E. Byrne 1, 660 fr s&wl Sect 147, T&NO Sur, 4 mi w LaBelle fld.	7-23-49	10536	8108- 8124	.....	F 122 mnl; open	
Wharton	.....	Gulf Oil Corp's J. H. H. Dennis 1, 1049.28-ac Lse, Rob't Kuykendall Lge, 2¾ mi w Wharton.	5-15-49	5376	5300- 5376	.....	F 9.3 mln; open	
Wharton	Wharton	The Texas Co's Mrs. Louise Hutchins et al 1, 2200 fr swl 330 fr nwl 203-ac Tr., Jas. Tumlinson Sur, 1¾ mi se Wharton.	7-18-49	6350	4666- 4673	.....	No gge	
		TEXAS—District 4 (LOWER GULF-S.W.)—New Oil Field						
Starr	Lockhart, SE.	I. K. Howeth et al's Domingo L. Garza 1, 488 fr sl 466 fr wl Lot 8, Sh 37-B, Porc. 80, 1⅛ mi se Lockhart fld.	7-16-49	4063	4034- 4036	.....	F 72; 91 wtr; 1/4"	43
		TEXAS—District 4 (LOWER GULF-S.W.)—New Oil Pays						
Cameron	Lacy	Sidney H. Smith Jr's O. W. Johnson 1, 330 fr n&wl Lot 14, Sect 8, Capisallo Tr, ¾ mi fr prod.	7-10-49	7552	7547- 7550	.....	F 118; 1/8"	45
Nueces	W. Corpus	Tide Water Assoc. Oil Co's Guaranty Title & Trust Co. 1 (OWWO), 660 fr n&wl Tr. 5, J. C. Russell Fm Lots, Enrique Villareal Gr.	7-12-49	11490	9065- 9068	.....	F 254; 3/32"	38
Nueces	Minnie Bock, N.	The Atlantic Ref. Co's W. S. Gandy 1, 2173 fr s&el Sect. 54, G. H. Paul Sbdn, J. Lopez de Herrera Sur, ½ mi s prod.	6-18-49	7250	5488- 5494	Zone 12 sd; Olig	F 37; 24 wtr; open	18
		TEXAS—District 4 (LOWER GULF-S.W.)—New Distillate Pays						
Hidalgo	McAllen	Coastal Refineries, Inc. & Mayfair Minerals, Inc's O. H. Pagelson 1, 330 fr el 660 fr nl Tr. 205, Kelly-Pharr Sbdn.	6-21-49	10395	9370- 9410	.....	F 529; 25 mln; open	
San Patricio	Morgan	Arnold O. Morgan & H. M. Reed's P. L. Johnson 1, 467 fr n&wl Sect 26, Geo. Morris Sur.	7- 3-49	7433	6564- 6569	.....	F 112; 6.2 mln; open	
		TEXAS—District 4 (LOWER GULF-S.W.)—New Gas Fields						
Brooks	.....	Humble O&R Co's Santa Fe Rch 4, 5280 fr ne&nwl San Salvador del Tule Gr, 1⅞ mi se Santa Fe fld.	7- 7-49	8491	5896- 5904	.....	F 2.9 mln; open	
Duval	.....	David Lee Hill Trustee's W. R. Peters Est. 1, 2078 fr nl 1935 fr wl of NW¼ W. A. Cavit Sur 38, 15 mi sw Freer.	7-11-49	2613	2600- 2610	.....	F 0.7 mln; ¼"	
Duval	.....	L. O. Kelsey & Bill Fallis' W. H. Sling 1, 330 fr sl 2310 fr el BS&F Sur 117, ¾ mi ne Seven Sisters fld.	7-25-49	3233	3038- 3042	.....	F 0.5 mln; ⅛"	
Jim Wells	.....	Sinclair Prairie Oil Co's A. H. Henderson 1, 40-ac Lse, Sect. 43, R. P. Haldeman Sbdn, Seeligson Tr, 2½ mi w Premont.	7-28-49	6517	5335- 5345	.....	F 6 mln; open	
		TEXAS—District 4 (LOWER GULF-S.W.)—New Gas Pay						
Hidalgo	La Reforma	Baldridge & King, Inc's Josefa Hinojosa 1, 467 fr n&el Sh 8, San Jose Gr., ½ mi e-se prod.	7- 1-49	8511	8430- 8446	.....	F 1.2 mln; open	

[1] Character of producing formations abbreviated thus: ch, chalk; dolo, dolomite; li, limestone; sd, sandstone; sh, shale; ser, serpentine; cgl, conglomerate. Ages of formation abbrevia thus: Plio, Pliocene; Mio, Miocene; Olig, Oligocene; Eoc, Eocene; U. Cre, Upper Cretaceous; L. Cre, Lower Cretaceous; Jur, Jurassic; Tri, Triassic; Perm, Permian; Penn, Pennsylvanian; Miss, Upper Mississippian; L. Miss, Lower Mississippian; Devo, Devonian; Sil, Silurian; Ord, Ordovician; Cam, Cambrian.

[2] Barrels of oil per day (24 hour rate), flowing (F), pumping (P), swabbing (Sw), or bailing (B); or million cubic feet of gas daily open flow capacity; size of choke given in inches.

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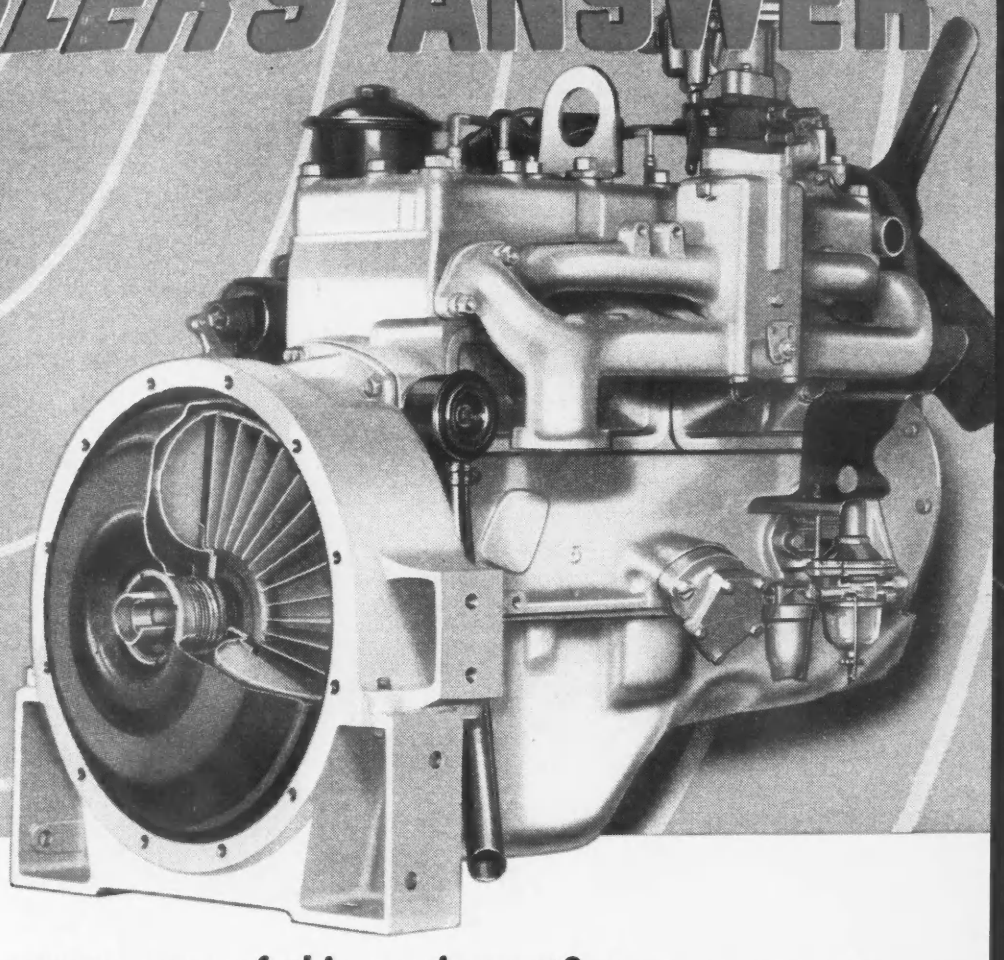

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New Oil, Distillate and Gas Fields and New Pay Horizons Discovered in the United States in July, 1949

Also Important Extensions to Established Fields

(CONTINUED)

COUNTY	FIELD	COMPANY, WELL AND LOCATION	Date Completed	Total Depth (Feet)	Completion Horizon (Feet)	[1]Name, Character and Age of Producing Formation	[2]Initial Production Method and Choke	Gravity of Oil
		TEXAS—District 5 (E. CENTRAL)—New Oil Field						
Kaufman	Wynne	R. W. Fair's Angus Wynne 1, 467 fr nl 2000 fr el B. S. Newman Sur, 5 mi sw Cedarvale.	7- 6-49	4987	4965- 4983	Paluxy sd; L Cre	F 230; 5/32"	30.1
		TEXAS—District 6 (NORTHEAST)—New Oil Fields						
Franklin	Lakeview	B. G. Byars & R. L. Peveto et al's Mark Talley 1, 1100 fr wl 1700 fr sl SPRR Co Sur, 8 mi n Mt. Vernon.	7- 6-49	4421	4418- 4421	Paluxy sd; L Cre	P 135	23.7
Wood		F. R. Jackson et al's Joe Carr 1, 330 fr nl 1100 fr wl Jas. Colson Sur, 4 mi w Mineola.	7-14-49	4740	4612- 4652	Sub-Clarksville sd; U Cre	P 30	18
		TEXAS—District 7-B (N. CENTRAL)—New Oil Fields						
Coleman		W. E. Stepps & T. J. Maxwell et al's Mrs. Geo. Sparkman et a 1, 1235 fr sl 3328 fr el S. Crooks Sur, 2½ mi s Coleman.	7-27-49	2117	2100- 2117	Brenke sd; Penn	F 133; ¾"	43.6
Coleman		Horace E. White's W. K. & Lula Terry 1, 660 fr el 1125 fr sl T&NO RR Sur 69, 2 mi n Taylor.	6-15-49	3147	3070- 3097	Palo Pinto li; Penn	P 84	43.5
Comanche		Sohio Pet Co's J. W. Ward 1, 1480 fr el 1330 fr sl Blk 25, Lampasas CSL Sur, 2½ mi nw Sidney.	7-20-49	2568	2525- 2568	Mississippi Reef li; Miss	F 345; ¾"	40
Haskell	S. Haskell	Stanolind O&G Co's John M. Pace 1, 330 fr s&wl of T. D. Owings Sur 111, 3¾ mi se Haskell.	7-14-49	3624	3610- 3615	Canyon Reef li; Penn	F 352; 5/32"	37
Jones		Ungren & Frazier's W. E. Hatchett 1, 3990 fr nl 1817 fr wl G. Martinez Sur 194, 1 mi n Hawley.	7-12-49	2215	2088- 2090	Flippen sd; Penn	F 841; ¼"	40
Nolan		Iowa-Payne Oil Co's N. L. McLeod 1, 330 fr n&wl NE¼ Sect 44, Blk 19, T&P Sur, 2 mi sw Trent.	7-28-49	5750	5124- 5131	Strawn sd; Penn	P 46	44
Shackelford	Coates Ranch	Humble O&R Co's F. G. Coates, Trustee 1-B, 1980 fr nl 990 fr wl Sect. 26, Blk 14, T&P Sur, 7½ mi se Nugent.	7-20-49	1731	1621- 1631	Bluff Creek sd: Perm	P 36	37.1
Stephens		McElroy Ranch Co's R. W. Tipton 1, 467 fr nl 998 fr wl of s'ly NWC Sect. 5, Blk 8, T&P Sur, 15 mi nw Breckendridge.	7- 2-49	4642	4525- 4565	Mississippi li; Miss	F 251; 11/64"	42.5
Stephens		Texas & Pacific C&O Co's Garvin Thomas Farm 1-A, 434 fr nel 6083 fr fr sel of N/187.9-ac of Sect 1125, TE&L Sur, 3 mi sw Eliasville.	7-30-49	4605	4392- 4438	Mississippi li; Miss	P 5; 17 wtr	41
Taylor	"Pinckley"	Geochemical Survey, Inc's J. S. Pinckley 1, 980 fr sl 330 fr wl Blk 1, Lge 124, Grimes CSL Sur, 1¾ mi ne Merkel.	7-27-49	2802	2709- 2713	Ingram sd; Penn	F 102; ½"	42
Taylor		J. P. Production Co. et al's N. V. Atwood 1, 330 fr n&wl of NE/132-ac of Sect. 433, J. C. Thompson Sur, 2½ mi sw Lawn.	7- 1-49	4121	4103- 4121	Gardner sd; Penn	F 75; ¼"	39
Throck-morton		Woodley Petroleum Co's Chas F. Leathers 2, 918 fr el 958 fr sl Sect. 934, TE&L Sur, 2½ mi nw Woodson.	7-19-49	4598	4411- 4437	Mississippian	F 64	43
		TEXAS—District 7-B (N. CENTRAL)—New Oil Pays						
Taylor	Salt Branch	West Central Drilling Co's W. E. Hays 2, 1750 fr sl 330 fr wl Sect. 4, D. B. Corley Sur.	7- 6-49	2576	2570- 2574	L. Hope li; Penn	P 155	42
Throck-morton	Murray	Wichita River Oil Co. et al's W. T. Donnell 3, 730 fr sl 1350 fr wl Sect. 2364, TE&L Sur.	7- 4-49	2863	2849- 2863		P 180	40
		TEXAS—District 7-B (N. CENTRAL)—Oil Field Extension						
Jones	Unnamed	Danciger O&R Co's Theodosia Harp 1, 1600 fr nl 330 fr wl Sect 11, Blk 14, T&PRR Sur, west extension.	7- 7-49	1736	1720- 1736	Bluff Creek sd; Penn	P 41	38
		TEXAS—District 7-B (N. CENTRAL)—New Gas Field						
Comanche		Sohio Pet Co's W. G. Chapman 1, 470 fr sl 630 fr wl Sect. 43, ETRR Sur, 2½ mi n Sidney.	7-20-49	2900	2160- 2220	Marble Falls li; Penn	F 9 mln	
		TEXAS—District 7-C (W. CENTRAL)—New Oil Fields						
Coke		Humble O&R Co's Jas L. Brunson 1, Sect. 331, Nicholas Eastland Sur, 2 mi s Bronte fld.	7-24-49	5864	4375- 4396	Palo Pinto sd; Penn	P 54; 18 wtr	46.5
Runnels		Humble O&R Co's Sally Odom 1, 785 fr nel 660 fr sel Felix Sosa Sur 302, 6 mi se Blackwell.	6-21-49	5480	5435- 5463	Strawn sd; Penn	F 319; 1/8"	42.3
Runnels		Texas Union Oil Corp's Hugh Campbell 1, 330 fr nl 1650 fr el J. Bays Sur 530½, 4 mi n Winters.	7-10-49	4602	3360- 3390	Palo Pinto li: Penn	P 4	
		TEXAS—District 7-C (W. CENTRAL)—Oil Field Extensions						
Upton	Benedum	Republic Natural Gas Co's Rosa Halff Barnett 1-D, 660 fr s&el of SW¼ Sect. 39, Blk Y, TCRR Sur, extends Ellenburger 1¼ mi nw.	7-16-49	11580	11390-11580	Ellenburger li; Ord	F 363; 3/8"	58
Upton	Benedum	Warren Wright's C. W. Chancellor 1, 660 fr n&el S½ of E½ Sect. 5, A. W. Daugherty Sur, extends Fusselman 2 mi s & Ellenburger ½ mi sw.	7-23-49	11525	11040-11110 11380-11525	Fusselman li; Ord Ellenburger li; Ord	F 624; 3/8" F 764; 3/8"	58 57
		TEXAS—District 7-C (W. CENTRAL)—New Gas Field						
Runnels		Mabee Drilling Co's Mrs. Malinda Jameson 1, 660 fr s&el A. G. Wells Sur. 210, 3 mi nw Talpa.	6-27-49	4165	3467- 3487		F 2.5 mln	
		TEXAS—Distr ct 8 WEST)—New Oil Fields						
Cochran		H. L. Cain & H. G. Maxey's L. S. Roulain et al 1, 467 fr s&el Tr. 8, Lge 130, Carson CSL Sur.	7-14-49	4888	4835- 4888		F 188; 1"	31
Gaines	"Doss-Wolf-camp"	Ralph Lowe's Helen Cunningham et al-Shell 1, 660 fr s&el NW¼ Sect. 4, Blk A-24, PSL Sur, ½ mi nw Doss fld.	7- 8-49	11881	8850- 8950	Wolfcamp li; Perm	F 458; ¾"	47
Gaines	Flanagan-Clearfork	George P. Livermore, Inc's Joe Head 1, 631 fr nl 610 fr wl Sect 12, Blk A-23, PSL Sur, ¾ mi s Flanagan fld.	7-13-49	10531	7217- 7241	Clearfork li; Perm	F 157; 11/64"	
Mitchell		Superior Oil Co's J. R. Dockery 1, 660 fr n&el Sect. 17, Blk 28, T-1-S, T&P Sur, 3 mi s Westbrook fld.	7- 8-49	8024	7979- 7989	Ellenburger li; Ord	F 171; 27 wtr 11/64"	45.3
		TEXAS—District 8 (WEST)—Oil Field Extensions						
Scurry	Sharon Ridge-Canyon	Humble O&R Co's Wright Huddleston 1, 660 fr sl 2080 fr wl Sect. 163, Blk 97, H&TC Sur, ½ mi w extension.	7-18-49	6685	6664- 6684	Canyon li; Penn	F 246; 5/32"	43.4
Sterling	Water Valley-San Andres	York & Harper, Inc. & J. P. Gibbons' L. C. Clark 1, 2333 fr nl 2416 fr el Sect. 6, Blk A, R. R. Wade Sur, 2½ mi nw extension.	7-27-49	873	868- 873	San Andres li; Perm	P 14	36.2
		TEXAS—District 9 (NORTH)—New Oil Fields						
Archer		Dub-Wood Drilling Co's J. J. Hrncirik 1, 750 fr nl 1300 fr wl S½ Sect. 1, EL&RB Sur, 6 mi n Megargel.	7-24-49	1500	1497- 1500	Gunsite li; Penn	P 6	
Archer		G. E. Kadane & Sons' J. M. Bloodworth 2-A, 330 fr el 1090 fr sl Blk 7, Geo. Bruner Sur, 2 mi w Scotland.	7- 8-49	4731	1306- 1319		P 15	38
Baylor		M. W. Blair's Mrs. Dottie S. Portwood 1, 1650 fr nl 1350 fr el Sect. 1280, TE&L Sur, 3½ mi sw Megargel.	6-22-49	1399	1391- 1399		P 15	
Cooke		Kay Kimbell's W. E. Winger 1, 330 fr s&wl Blk 84, Fannin CSL Sur, 1½ mi Walnut Bend fld.	7-24-49	5867	5854- 5867	Strawn sd; Penn	P 210	34
Grayson		Standard of Texas' Beth Brown et al 1, 1070 fr wl 2200 fr nl H. C. Atkinson Sur, ½ mi e Sherman.	7-21-49	4541	3348- 3380	Strawn sd; Penn	P 193	30.6
Jack		Jones-Simpson Drilling Co's Lydia Chipman 1, 330 fr s&el R. Barr Sur, 4 mi w Chico fld.	7-20-49	5908	5648—5664	Conglomerate	F 16; 1/16"	43
Jack		Mid-Continent Pet. Corp's J. F. Boyd 2-A, 3170 fr el 1160 fr sl of Lse, S. H. Hazel Sur, 2 mi se Post Oak fld.	7-28-49	6342	6293- 6342	Ellenburger li; Ord	F 533; 3/8"	45.
Wichita		Roy H. Lebus' Will Burnett 1, 400 fr nl 150 fr wl W. Williams Sur, 3 mi sw Iowa Park.	7-14-49	1460	1455- 1460		P 5	
Young		T. A. Wright et al's M. K. Graham 1, 1263 fr el 330 fr sl Sect. 2390, TE&L Sur, 5 mi n Murray.	7-27-49	4603	4104- 4126	Bend li: Penn	P 22	31.7
		TEXAS—District 9 (NORTH)—Oil Field Extension						
Cooke	Burk-Bentley	Kay Kimbell's Bodovsky 2 ,970 fr el 400 fr sl A. C. C. Bailey Sur, ½ mi e extension.	7-18-49	2141	2131- 2141	Strawn sd; Penn	P 75	
		UTAH—New Oil Field						
Garfield		California Co's Upper Valley Unit 1, SW NW 12-36s-1e	7- -49	8857	8777- 8786	Pennsylvania li; Penn	P 504	18
		WEST VIRGINIA—New Gas Field						
Preston		Hope Natural Gas Co's J. Paul Martin 2-9331, Portland district	7- 49	5360	4926- 4965 5179- 5330	Chert: Devo Oriskany sd; Devo	F 2.1 mln	

[1] Character of producing formations abbreviated thus: ch, chalk; dolo, dolomite; li, limestone; sd, sandstone; sh, shale; ser, serpentine; cgl, conglomerate. Ages of formation abbreviated thus: Plio, Pliocene; Mio, Miocene; Olig, Oligocene; Eoc, Eocene; U. Cre, Upper Cretaceous; L. Cre, Lower Cretaceous; Jur, Jurassic; Tri, Triassic; Perm, Permian; Penn, Pennsylvanian; U. Miss, Upper Mississippian; L. Miss, Lower Mississippian; Devo, Devonian; Sil, Silurian; Ord, Ordovician; Cam, Cambrian.

[2] Barrels of oil per day (24 hour rate), flowing (F), pumping (P), swabbing (Sw), or bailing (B); or million cubic feet of gas daily open flow capacity; size of choke given in inches.

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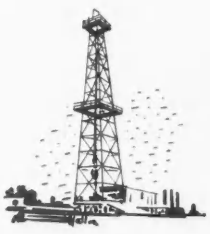

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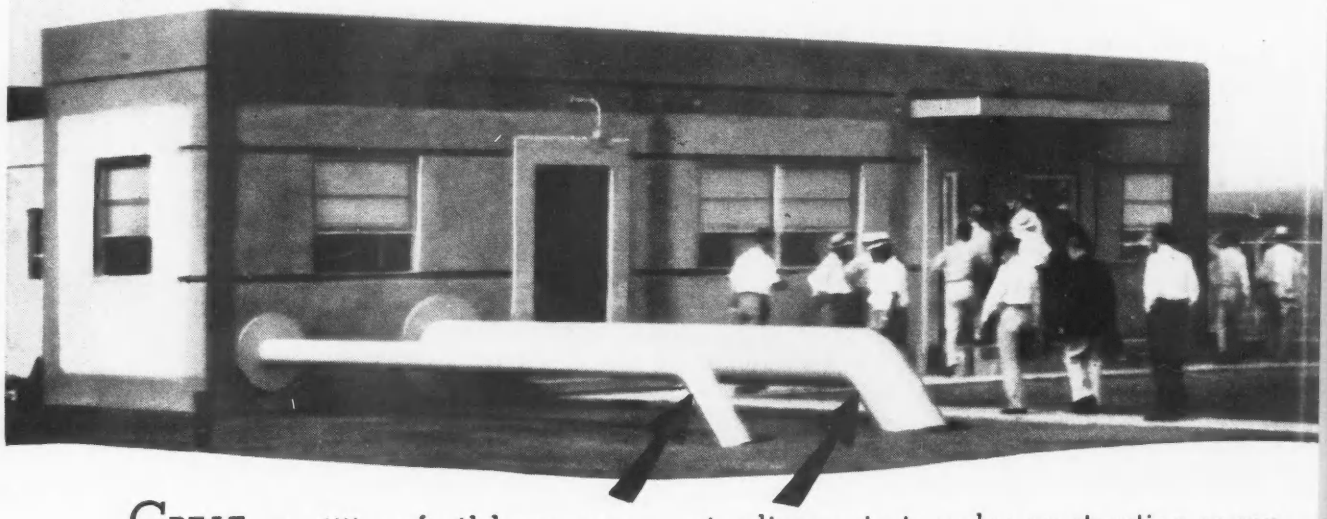

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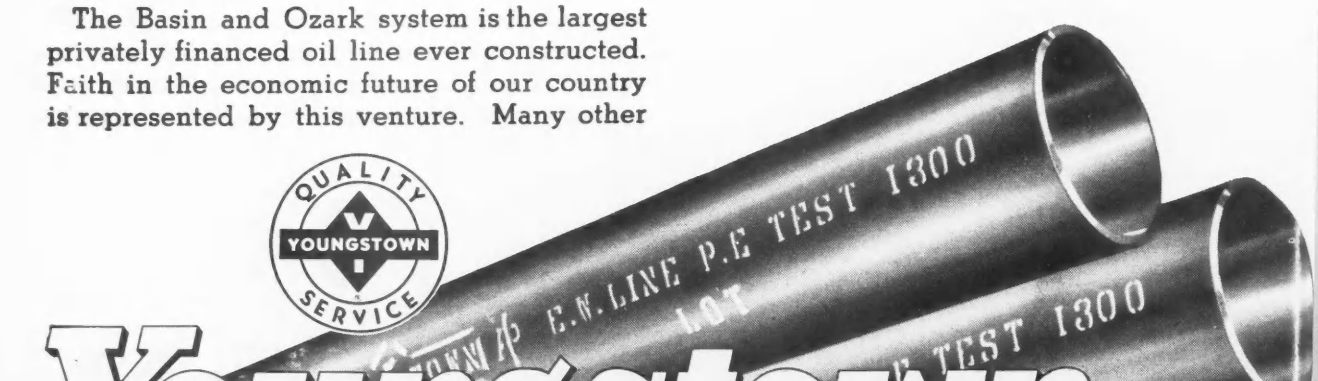

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SQUEEZE Cementing

By A. W. WALKER

Associate Professor, Petroleum Engineering Department, University of Tulsa

THE AUTHOR correlates data on the effect of high pressures in squeeze jobs, and investigates the possibilities of horizontal and vertical fracturing of the formation. He also discusses the possibility of horizontal expansion of bore-hole under cementing pressures.

SQUEEZE operations were first undertaken in connection with cement plugbacks in the middle and late 1930's. At that time it was considered necessary that the formation first be broken down with water. It was visualized that the breakdown process caused a disintegration of the sand, erosion of the sand, or fracturing along bedding planes. At about the same time it was found that the input of water-injection or gas-injection wells could be increased by periodically breaking-down the formation with high pressures. A casual examination of the surface pressures indicated that the breakdown pressures approximated the overburden pressures, thus, it was assumed that the breakdown pressures physically lifted the formations along horizontal partings and that the cement was disposed of along said partings.[2, 3, 4, 5] It was recognized, however, by Dickey and Andresen[6] that the breakdown of the formation might result in vertical fracturing.

More recently, squeeze cementing operations have been used extensively in conjunction with selective well completions through perforations, to correct faulty cement operations or as a supplement to them.[7, 8] In many instances large volumes of mud and cement have been displaced during the process of squeezing, sometimes involving several stages or operations. This study endeavors to determine more definitely just what happens during squeezing, both in regard to the well-bore and the surrounding formations.

REVIEW OF LITERATURE

Overburden Pressure

The effect of the overburden on underlying rocks has long been recognized by geologists and it is accepted that all rocks, especially shales, are compacted as a result of the overburden pressures. The degree of compaction has been studied by Athy[9] and Hedberg.[10] Recently these earlier studies have been confirmed by several thousand tests of Gulf Coast shales, which increase in specific gravity from 2.0 at 3000 feet to 2.6 at 12,000 feet.[11] These correspond to 0.87-1.125 pounds per square inch per foot of depth respectively, discounting the increase in density when under the actual pressures of the overburden. Such an increase would be partially offset by the sands in the section, which undergo relatively little compaction.

Earlier studies by the writer of normal and troublesome wells in the Gulf Coast Area showed a definite correlation of abnormal pressures to overburden pressures (Figure 1). Many fields had normal pressures which correspond closely to the hydrostatic gradient. A few fields, generally associated with piercement salt domes, showed abnormally high pressures, as reflected by heaving shale, high-pressure salt-water or gas flows. It was observed that in most cases the abnormal pressures did not exceed a curve as indicated on the graph. Recently a well was tested at 10,900 feet for a pressure of 9300 feet pounds per square inch, which point falls almost exactly on the abnormal pressure curve. During the drilling of the sand a mud of more than 18 pounds per gallon was required, and it could not vary more than 0.3 pounds per gallon without causing either loss of mud or kicking, thus indicating a very delicate balance. There have been a few exceptional cases where higher pressures have been encountered which almost equalled the full pressure of the overburden.

It appears obvious that where beds are completely confined by either faulting or pinching-out, such as is associated with piercement salt-domes, it is possible for the formation liquids to have pressures approaching that exerted by the overburden. Such a condition is accepted by many, but there are those who believe that the competency of beds or the strength of the rocks will support the overburden so that its full weight will not be effective on either the formations or the formation fluids. This question has been discussed at length by several geologists, engineers and geophysicists, and is well expressed by M. King Hubbert.[12]

Stress and Force Analysis

If we assume that all overlying rocks are supported by the underlying ones so that the full overburden pressure is effective, it is impossible to account for rupture of the formations by horizontal partings, unless the overburden pressures are exceeded by the bonding strength of the rocks, which seldom is the case. It therefore becomes necessary to examine more closely the mechanics and stresses about the well-bore. Several formulas have been developed in connection with the failure of a cylinder, which is analogous to that of well-bores. The most common is Barlow's formula for pipe:

$$p = \frac{2St}{D}$$

Under this formula the failure is always longitudinal, unless there is an extreme fault in the pipe. Similar formulas have been developed for thick walled cylinders, of either metals or brittle materials, and they are all based on longitudinal ruptures.[13]

After Timoshenko and Lessells:

$$S_t = \frac{P\,(a^2 + b^2)}{(b^2 - a^2)}$$

After Seeley:

$$\frac{b - a}{2} = a\frac{Ew + (1 - m)\,P - w}{Ew - (1\,m)\,P} - 1$$

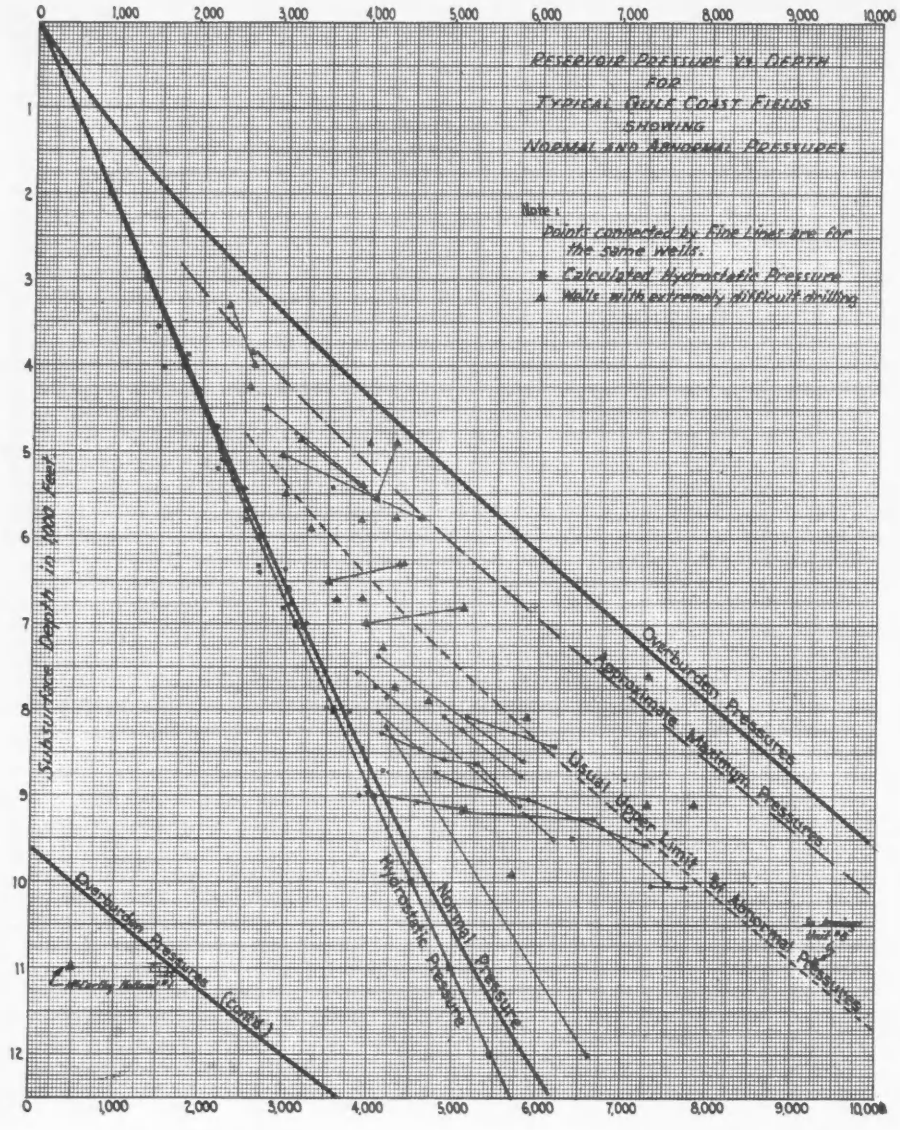


FIGURE 1. Graph of normal and abnormal pressures for typical Gulf Coast fields, showing reservoir pressure-depth relations.

TABLE 1

Fluid Pressures in Respect to Natural Pressures

Well	Depth	Job	Stage	BREAKDOWN PRESSURE IN EXCESS OF		Amount and Kind of Squeeze Material
				Overburden	Hydrostatic	
1	6873′—74′	1	1	+ 50 psi	+3900 psi.	125 sacks cement
	6872′—74′		2*	−1000	+2700	50 sacks cement
	6874′		5	−1500	+2200	50 sacks cement
	6874′		4	−1750	+1950	50 sacks cement
	6673′—74′	2	1	+2250	+5950	85 sacks cement
	6873′—74′		2	−1000	+2700	105 Gal. Plastic
	6873′—74′	3		− 300	+3400	125 sacks cement
	6630′	4		+1010	+4600	125 sacks cement
2	6340′	1	*	− 900	+2000	196 sacks cement
	6340′	2		− 800	+2200	110 sacks cement
	6316′	3		−1100	+2300	125 sacks cement
3	5280′			−1600	+1300	91 sacks cement
			*	− 700	+2200	
4	3775′†		*	+ 400	+2030	37½ sacks cement
5	10450′		*	+2100	+4100	88 sacks cement
6	8965′		1	− 700	+5400	80 sacks cement
			2	− 100	+6000	80 sacks cement
	8960′			− 250	+4360	73 sacks cement
7	10100′		*	−3060	+2900	33 sacks cement
8	6018′†		1	+1100	+4250	100 sacks cement
			2	+2600	+5750	100 sacks cement
			3	+ 700	+3550	80 sacks cement
9	6010′		1*	− 300	+2850	145 sacks cement
			2	− 600	+2550	100 sacks cement
			3	− 250	+2900	100 sacks cement
10	9514′	1	*	− 250	+3980	Mud
		2				32 sacks cement
11	2635′	1	mud*	− 80	+1050	16 bbl. mud
			cement			137 sacks cement plus 5 bbls. water
12	8990′	2		− 450	+5600	90 sacks cement

NOTES: * Considered typical to show true breakdown pressures.
† Old oil wells being plugged back to shut off water.

Where:

p = Internal Pressure
b = Outside radius
a = Inside radius
S_t = Compressive force
t = Thickness
E = Modulus of Elasticity
m = Poisson's ratio
w = Allowable deformation

A more complete analysis of this problem was made by Dr. Westerguard of the Harvard Graduate School of Engineering.[14] This problem was further analyzed by Dr. Aaron Miles[15, 27] and it was determined that the stresses about the well would cause vertical shear planes and prismatic spalling across bedding planes. It is interesting to note that this type of fracture was often found during cable tool drilling in Oklahoma, and known as "pencil caves." Reports indicate that most shale fragments on shale-shakers in the Gulf Coast area are conchoidal or sub-conchoidal fractures across bedding planes.[16] Both types of fragments confirm the presence of vertical shear planes as the result of the weight of the overburden and it is, therefore, logical to assume that it will be necessary to overcome the weight of the overburden before it can be lifted and parted horizontally.

Disposal of Cement

Various theories have been advanced as to the actual manner in which the cement is disposed of in the squeeze operations. Since one of the main purposes of this operation is to correct for original faulty cementing of the casing, it is reasonable to assume that much of the cement replaces old drilling mud, through which the cement had channelled and which had been left behind during the original operation. Several writers, including C. A. Pitts,[17] Teplitz and Hassebrook,[18] and Jackson and Campbell,[19] have presented evidence or theories to support this method of disposal of cement. Several other writers interpret the squeeze cementing operation as a method of physically forcing cement into the formations.

Another theory tentatively suggested by Teplitz and Hassebrook postulates that much of the cement is accounted for by the expansion of the bore-hole under the extreme pressures of squeeze operations. This would involve the compression of the beds and the elongation of the material around the periphery of the bore-hole. Investigating this possibility, tests of marble show that the elongation within the elastic limit is not more than 2 percent.[20] It seems impossible to expect sufficient enlargement of the well-bore without rupture

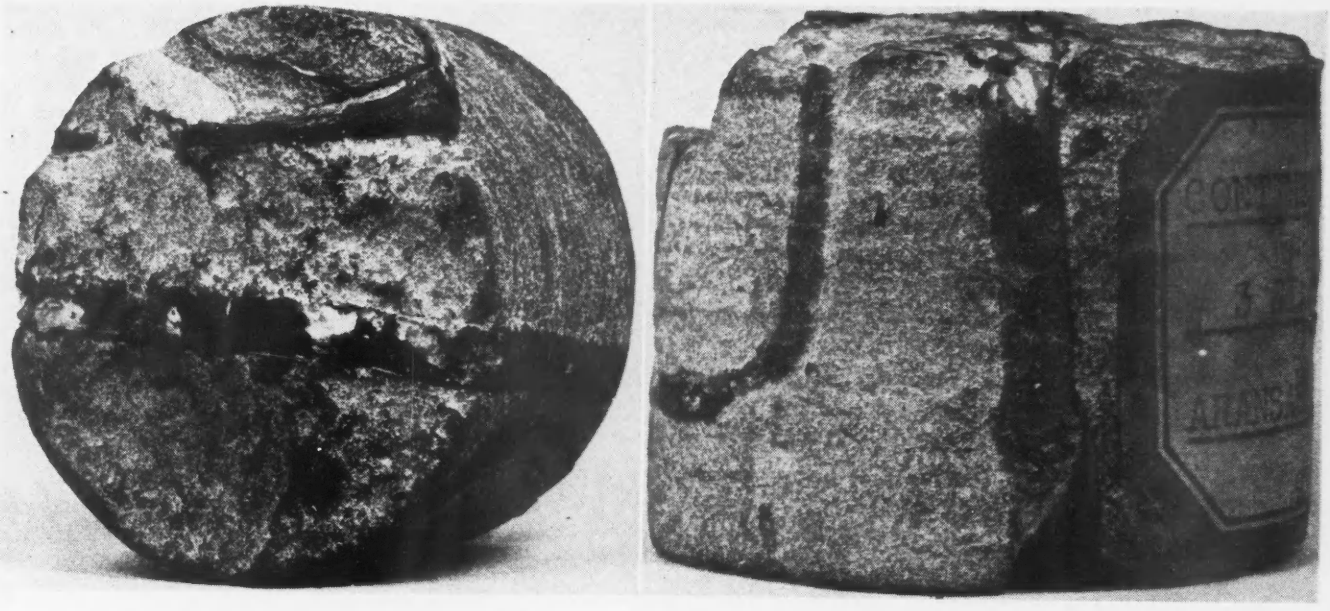
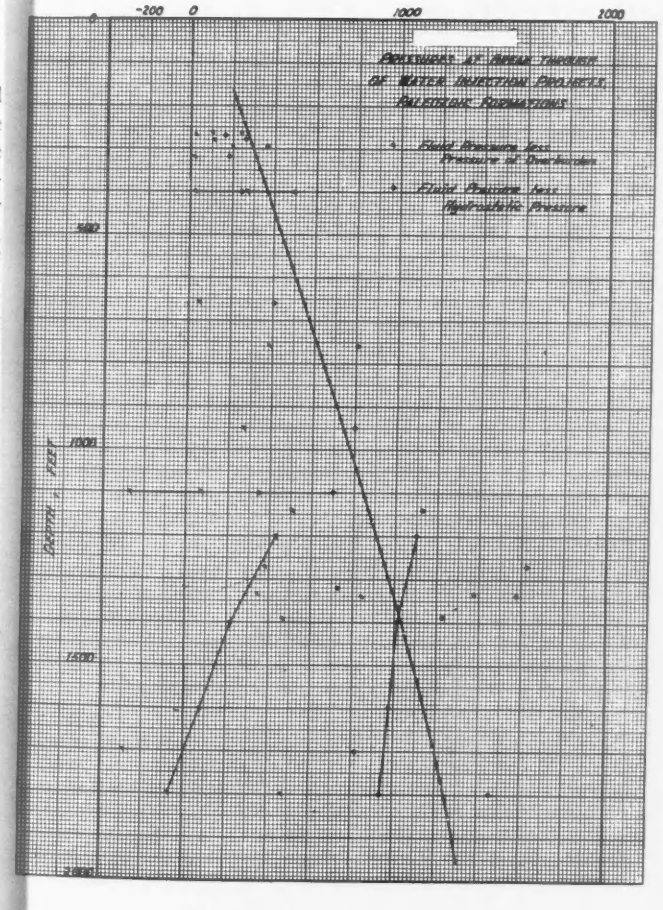


FIGURE 2 (Left). Top view of core from sidetracked well, Corpus Christi area, showing vertical fracture zones filled with cement.

FIGURE 3 (Right). Side view of core shown in Figure 2, taken in whipstocked hole 25 feet from old, squeezed hole.



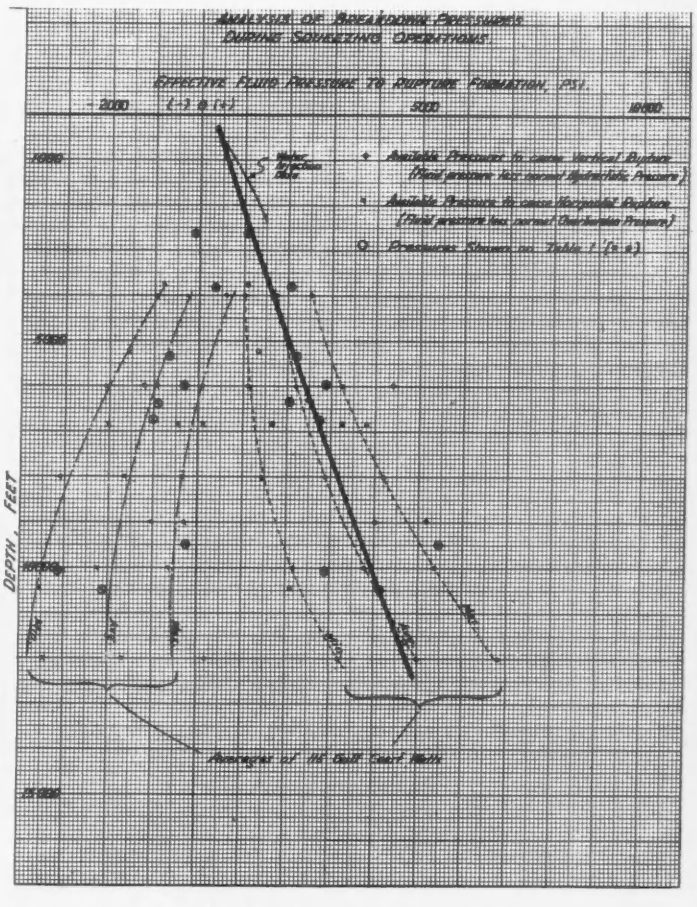


FIGURE 4 (Left). Effective pressures at the face of sand in respect to either horizontal or vertical fracturing.

FIGURE 5 (Right). Analysis of breakdown pressures showing components available to cause vertical and horizontal rupture.

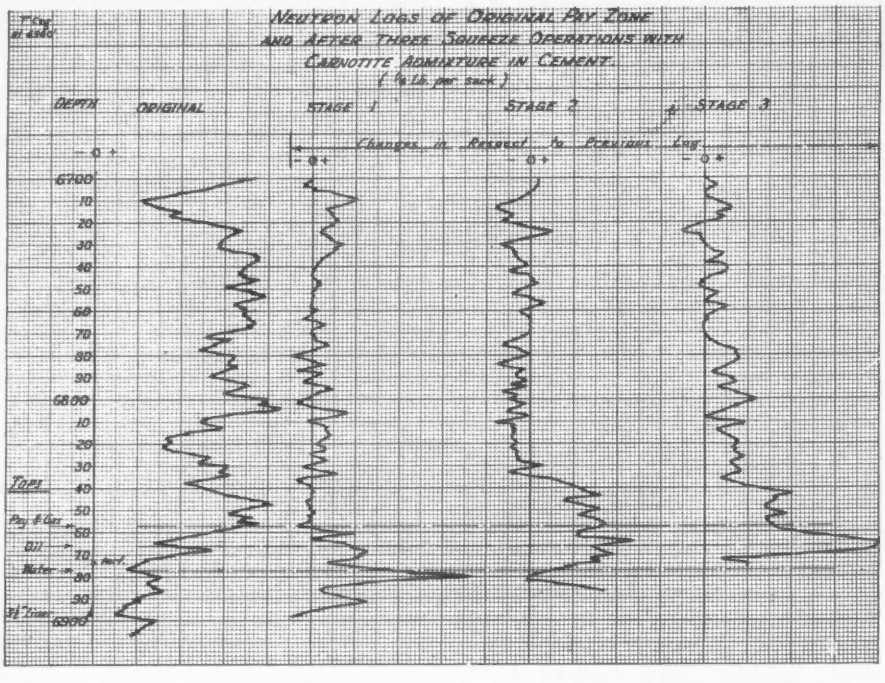


FIGURE 6. Changes in neutron log after three successive squeeze operations with carnotite admixture in cement.

to account for any appreciable amount of cement or mud.

Core Data

Two contradictory sets of data from cores taken in combination with squeeze jobs are found in the literature. At a Continental Oil Company well in the Corpus Christi, Texas, area it was found necessary to squeeze the well with cement and subsequently to drill a new whipstocked hole approximately 25 feet from the old hole. The cores of the squeezed formation in the whipstock showed the vertical fracture zones to be filled with cement, Figures 2, 3. This is the same core that was recently illustrated by Teplitz and Hassebrook.[21]

The only known case of conclusive proof of lifting the overburden was reported by Paul Torrey.[22] It was stated that cores of a sidetracked well gave alternate laminations along horizontal bedding planes of shale and cement. No record or indication was given as to the squeeze pressures for this particular well located in Northern Louisiana, but a squeeze job in the Lisbon field reports a pressure at the formation at 8354 feet of 10,000 pounds per square inch. Such a pressure could very possibly have caused horizontal lifting, but pressures of this magnitude are not common in present-day squeeze-cementing operations.

Pressures to Fracture Rocks

In order to determine the forces which are effective on the reservoir rocks, an analysis has been made of all available squeeze operation data, both water-injection and cement squeezes. It was assumed that the pressure effective to lift the overburden was the fluid pressure less the weight of the overburden, and that the pressure effective to rupture the breakdown formations vertically was equal to the fluid pressure less the hydrostatic pressure for the corresponding depth. Figure 4 gives curves of the effective pressures at the face of the sand in respect to either vertical or horizontal fracturing at relatively shallow depths, in older Paleozic rocks. These data were taken from the literature.[23, 24, 25] It will be observed that there is very little correlation between the pressures available to lift the overburden. In several cases they are negative values. There is, however, a fair correlation in respect to the pressures available to rupture the formations vertically and these pressures increase with depth as would be expected. The two light lines connect pressures from only one source, and indicate reverse relationships. It is felt that they probably represent incomplete or insufficient tests.

The above study was carried further by using breakdown pressures taken from squeeze jobs. The Stanolind Research department analyzed 115 squeeze jobs in the Gulf Coast area and obtained average, maximum, and minimum values for the fluid breakdown pressures. Recently several squeeze jobs have been run and detailed records have been kept. The breakdown pressures have been resolved into available pressure for vertical or horizontal fracturing and have been plotted on Figure 5. The points circled are from Table 1.

These results are even more conclusive in that they show a reasonable relationship in respect to vertical fracturing and negative pressures with poor relationships for horizontal fracturing. It is interesting that the strength of rocks, which will correspond to the rupturing pressure, increases with depth. (No attempt has been made to reduce this strength to specific values because no exact formula is available.) The relationship of greater strength with in-

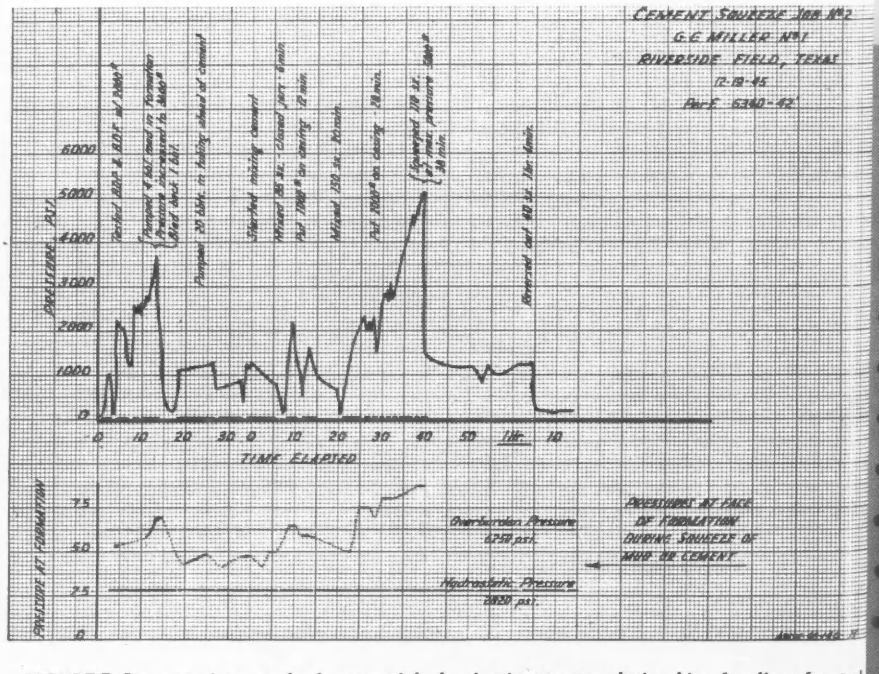


FIGURE 7. Pressure-time graph of cement job showing input rate relationship of well perforated at 6340-42 feet.

Years ahead

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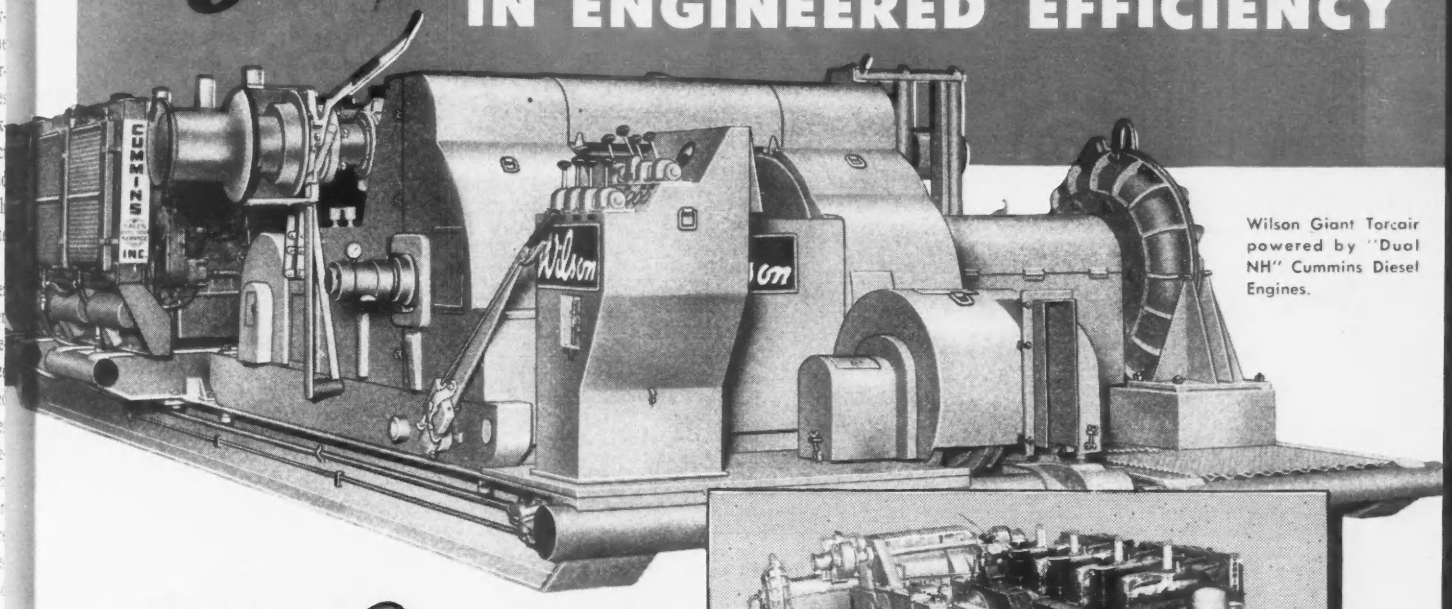

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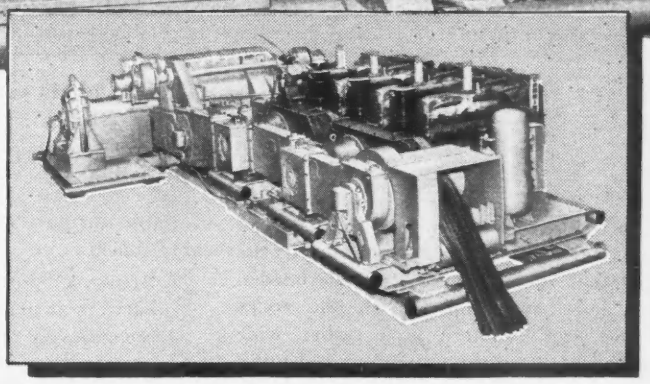

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frequently is necessary to slow down or completely stop the pumps in order to build up higher pressures. It is thus probable that the cement at that stage is being pumped into vertical fractures or fissures within the formations. Such a condition is supported by the stress analysis mentioned above and by field data. In a recent Gulf Coast operation, it was considered desirable to squeeze a well behind a liner in order to shut off excessive gas overlying a thin oil section. Several squeeze jobs were performed with cement plus carnotite. There was practically no evidence of the cement going up behind the pipe, but rather that it all went into the producing section. A series of neutron surveys were made which indicated that the distribution was relatively uniform throughout the section in all cases, as shown by Figure 6. These data have been interpreted as representing cement travel into and through vertical fractures.

Field Core Tests

Stanolind performed special tests to determine the path of travel of the cement. In Case 1 the well was drilled to 9523 feet where 9⅝-inch casing was set and a small diameter hole (3⅞-inch) was then drilled nine inches into a sandy-shale formation. A regular cement squeeze operation was performed after which the rathole and an additional foot of section were cored with a catch-basket type of core-barrel. The recovery of the rathole was very poor due to broken-up formation, but six inches of new formations were recovered in one piece. Upon examination it was found that both the small pieces and the large core were cut by vertical fracture zones which had been filled with cement, Figures 10 and 11.

A similar experiment was performed in another Gulf Coast well with corresponding results, Case 2. At this well, casing was set at 2625 feet, a rathole was drilled and then squeezed with cement, after which the rathole and formation were cored. Apparently there was a thick wall of mud left in the hole, because a central core of cement with vertical cement courses or wings was recovered (Figures 12 and 13). These cement courses were either vertical or transverse to the bedding, and have been interpreted to demonstrate that the cement entered the formations through vertical fractures.

In Case 1 the overburden pressures were not exceeded during the breakdown, or cement placement operations, but only after the cement had all been displaced and partially set up. In Case 2, the overburden pressure was not exceeded during mud squeeze, but was exceeded continually during cement squeeze, so that either type of fracture could have occurred. Actually, the vertical fractures predominated. It was the conclusion of the field men that these tests demonstrated the probability of vertical fracturing.[26]

On the basis of core data obtained in conjunction with actual squeeze operations it can be concluded that both horizontal and vertical fracturing may be expected, but only vertical fracturing at pressures at the formation of less than the actual weight of the overburden. This is further confirmed by reports from rotary drilling operations where drilling muds have channeled from a drilling well to a nearby producing well, and where the weight of the mud was far less than that required to offset the overburden pressure. No satisfactory explanation has been given for many of these cases, since it is known that mud cannot flow through sand as such. The most reasonable explanation of this condition is by vertical fracturing.

Conclusions

A careful and detailed study of all available data on squeeze operations and consideration of fundamental principles leads to the following conclusions:

1. The weight of the overburden causes a pressure on the underlying formations of approximately 1.0 pounds per square inch per foot of depth, with minor adjustments for various geologic provinces, and for increasing gradients with depth.

2. Geological considerations and field observations indicate that the full weight of all overlying rocks is effective upon all lower formations, at least below 5000 feet from the surface.

3. Competence of beds has only a minor effect in flat-lying beds in such areas as the Gulf Coast and Mid-Continent.

4. Natural fluid pressures within formations bear no relationship to overburden pressures, except where porous rocks are completely sealed off by faults, structural, or stratigraphical features (pinchouts and fault-blocks around salt domes).

5. "Breakdown-pressures" of rocks bear reasonable relationships to the depth and to differential pressure in respect to breakdown minus hydrostatic pressures.

6. "Breakdown-pressures" show very poor correlation with "overburden pressure," and in many cases the effective fluid pressures are negative quantities.

7. The pressures or forces necessary to rupture the formation vertically do not necessarily bear any direct relationship to the weight of the overburden, but do increase with depth.

8. Stress analyses of hollow cylinders

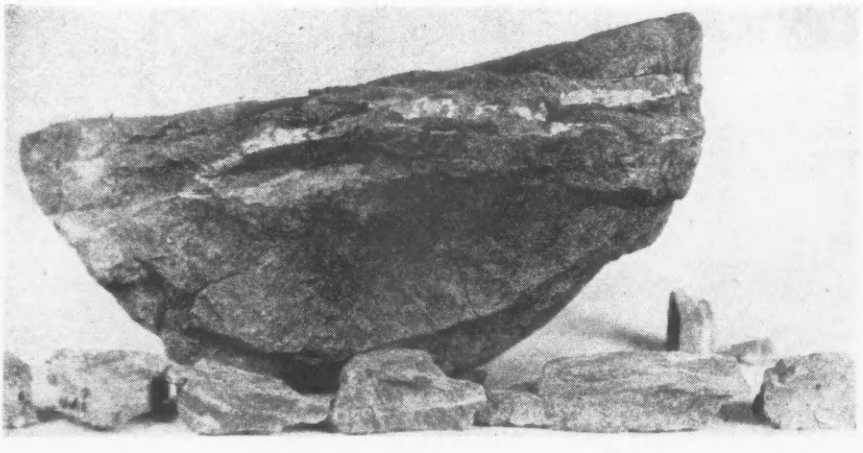

FIGURE 10 (Left). Top view of core below rathole which had been squeezed. Cement forced into vertical fractures is clearly evident.

FIGURE 11 (Right. Side view of core shown in Figure 10. Type of fracturing below base of rathole is clearly shown, as is cement infiltration.

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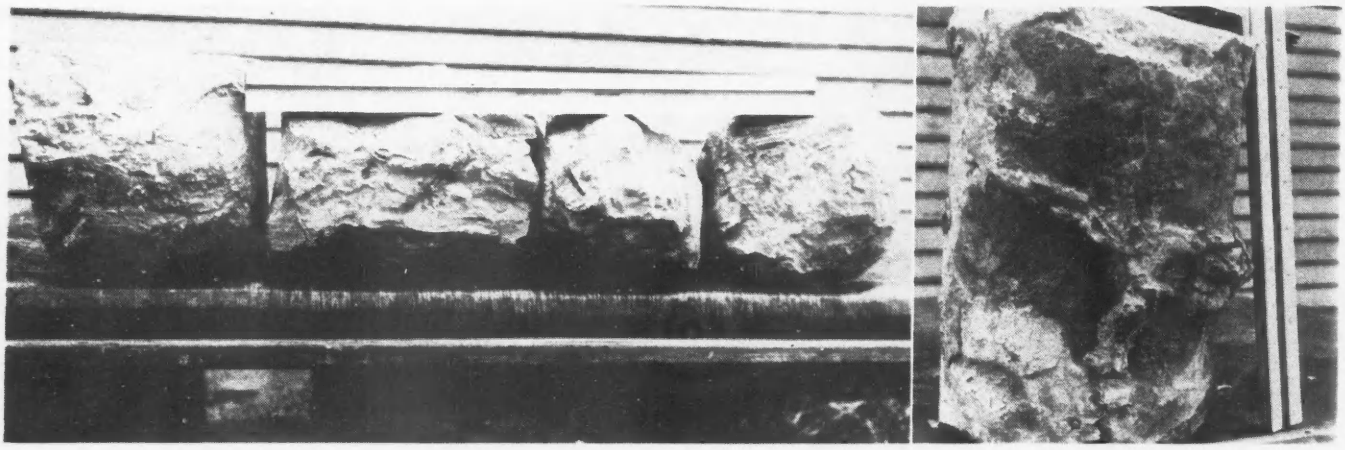

FIGURE 12 (Left). Several cores taken from squeeze operations at 2625 feet with cement in vertical courses.

FIGURE 13 (Right). Core showing interbedding of thick mud wall in hole with cement courses vertical and transverse to bedding planes.

show that fluid pressures exert a tendency in all cases for the cylinders to rupture longitudinally rather than circumferentially.

9. Vertical fracturing is confirmed by the necessity to use higher breakdown pressures with smaller diameter holes.

10. Large quantities of mud and cement are often pumped into wells and formations at pressures considerably less than the pressure which would be exerted by the overburden.

11. Pressures sufficiently high to overcome the weight of the overburden are encountered only near the end of squeeze operations, and are indicative of a completely impervious cement job with negligible displacement of cement, rather than a process involving fracturing.

12. Core data from squeeze cement operations confirm the possibility and probability that vertical fracturing will predominate when the breakdown and injection pressures are at or below one pound per square inch per foot of depth.

13. Horizontal compression of beds is possible, but since fracturing is due to failure in tensile strength, there are no grounds for large volume compression of beds (a five percent elongation should cause rupture of any rock substance).

14. It can be assumed that the cement or mud displacement proceeds in the following sequences or types, arranged in the order of increasing fluid pressures at formation.

A. Displacement of mud behind pipe

B. Vertical fracturing of formations

C. Dehydration of mud and cement

D. Horizontal fracturing of beds

15. Vertical fracturing of beds by true liquids should be beneficial in increasing the effective permeability of producing horizons.

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The writer thanks the management of Stanolind Oil & Gas Company for permission to publish this paper; G. S. Bays for suggestions and advice; Dr. Aaron J. Miles for his discussions of the general principles on stress-analysis and fundamental mechanics; R. J. Riggs for suggestions and views in regard to geological considerations; H. M. Northcutt for assistance in preparing the analyses of well test data and for the drafting work; and Continental Oil Company for permission to use the illustrations. This article is revised for WORLD OIL from a thesis submitted to the faculty of the School of Mines and Metallurgy, University of Missouri, Rolla, Mo.

About the Author

A. W. WALKER graduated from the Missouri School of Mines, Rolla, Mo., in 1924 with a B.S. degree in Mining Engineering. After 18 months in Venezuela with Sun Oil Company he returned to Rolla and took post-graduate work in geology and petroleum engineering. For three years he did general field work in the Oklahoma and Texas oil fields and then joined Stanolind Oil & Gas Company and covered East Texas during 1931-32. He was an organizer of the East Texas Engineering Society.

For the next 15 years he worked on field, office and research problems for Stanolind in the Mid-Continent, Gulf Coast and the Rocky Mountains. Since November, 1947, he has been Associate Professor of Petroleum Production at the University of Tulsa and has continued to work on special problems.

REFERENCES

[1] Torrey, Paul D., Selective Exclusion of Fluids from Wells, Oil Weekly, p. 29, Vol. 93, No. 11 (May 22, 1939).

[2] Ibid. p. 29.

[3] Grebe, John J., Tools and Aims of Research, Chemistry and Engineering News, Vol. 21, No. 23, P. 2010 (Dec. 10, 1943).

[4] Dickey, Parke A. and Andresen, Kurt H., Behavior of Water Input Wells (Part 4), Oil Weekly, Vol. 12, No. 2, p. 44, (Dec. 10, 1945).

[5] Yuster, S. T., and Calhoun, John C., Jr., Pressure Partings of Formations in Water Flood Operation, Oil Weekly, Vol. 117, No. 2, p. 38 (March 12, 1945).

[6] Op. Cit. Page 47.

[7] Pitts, C. A., Oil Well Cementing, Petroleum Engineer, Vol. 15, p. 88, (March 1944).

[8] Teplitz, A. J., and Hassebrook, W. E., An Investigation of Oil Well Cementing, Drilling and Production Practice, p. 77, (API 1946).

[9] Athey, L. F., Compaction and Oil Migration, AAPG. Bull., Vol. 14, No. 1, p. 31 (Jan. 1930).

[10] Hedberg, Hollis D., Effect of Gravitational Compaction on Structure of Sedimentary Rocks, AAPG, Bull., Vol. 10, No. 11, p. 1055 (Nov. 1926).

[11] Reno, H. D. Stanolind Research Laboratory Report.

[12] Hubbert, M. King, Strength of the Earth, AAPG. Bull., Vol. 29, No. 11, p. 1653 (Nov. 1945).

[13] Esbach, Ovid W., Handbook of Engineering Fundamentals, John Wiley, New York, 1936, part 5, p. 53.

[14] Westerguard, H. M., Plastic State of Stresses Around a Deep Well, Boston Society of Engineers, Vol. 27, No. 1, p. 2 (Jan. 1940).

[15] Miles, Aaron J., and Topping, A. Dale, "Stresses Around a Deep Well"; A.I.M.E. T.P. 2411, Petroleum Technology, Vol. 11, No. 6, Nov. 1948.

[16] Personal Communication, T. F. Keating.

[17] Op. Cit. p. 92.

[18] Op. City. p. 96-93.

[19] Jackson, Warren J. and Campbell, John L. P., Some Practical Aspects of Radioactivity Well Logging, A.I.M.E. (TP-1923) Petroleum Technology, p. 16, Vol. 8, No. 5 (Sept. 1945).

[20] Handbook of Physical Constants, O.S.A. Special Paper 36, pp. 124 (1942).

[21] Op. Cit., Teplitz and Hassebrook, p. 79.

[22] Torrey, Paul D., Progress in Squeeze Cementing Application and Technique, Oil Weekly, Vol. 98, No. 8, p. 68.

[23] Op. Cit., Dickey, p. 43.

[24] Op. Cit., Yuster, p. 40.

[25] Stekoll, Marion, Complete Bypassing of Oil in Water-flooding Operations, Oil Weekly, Vol. 121, No. 2, p. 40, (March 11, 1946).

[26] Lee, L. Company Report.

[27] Topping, A. D., Wall Collapse in Oil Wells as Results of Rock Stresses, WORLD OIL, Vol. 129, No. 3, p. 112 (July, 1949).

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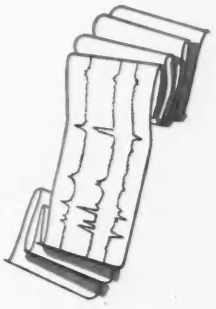

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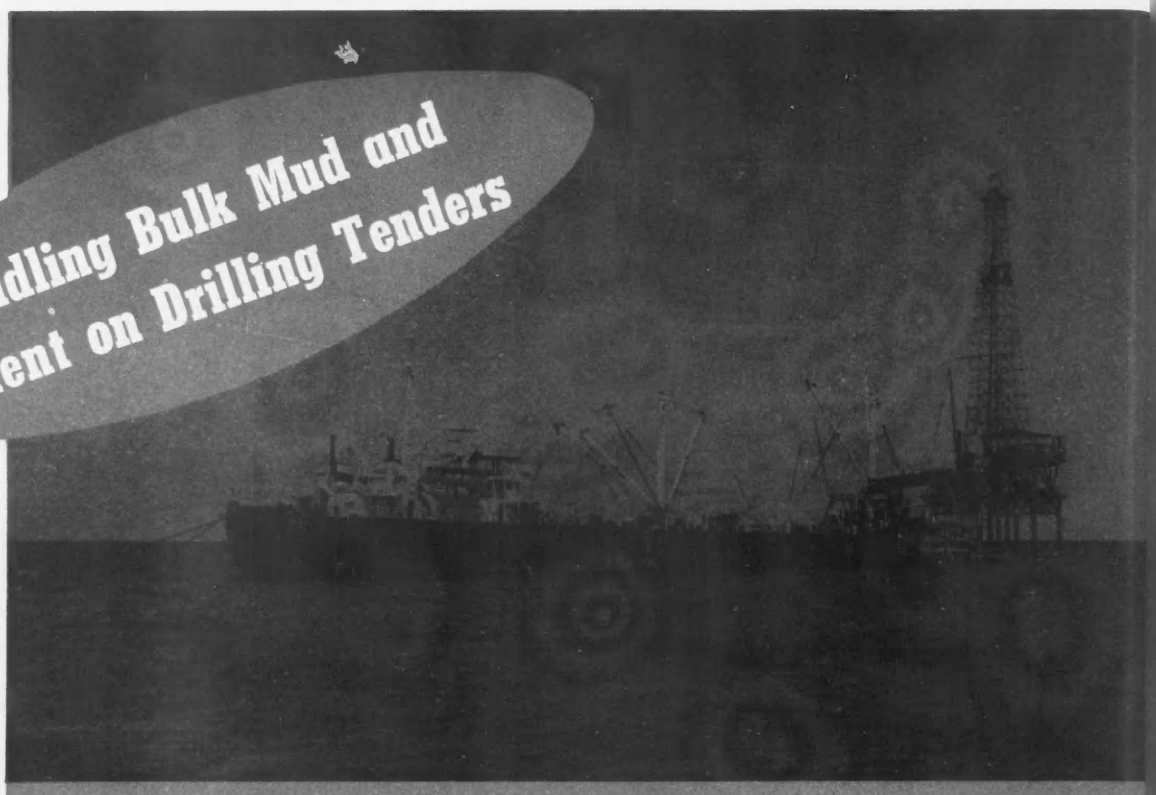
Handling Bulk Mud and Cement on Drilling Tenders



The California Company's S-21 drilling tender heading into prevailing southeasterly winds at location in the Bay Marchand field four miles off the Louisiana coast.

By J. E. KASTROP
Staff Writer

LARGE weather-tight storage compartments and helical screw-type conveyors are of considerable aid to The California Company in solving the problem of storing and handling bulk mud weighting materials and cement aboard offshore drilling tenders. This new method of handling large quantities of these two consumable items eliminates much of the strenuous labor involved when excessive volumes of cement or weighting materials must be mixed quickly. Bulk storage provided in either case also protects the contents from damage, thereby eliminating much of the waste that is characteristic of offshore work.

The nature of drilling for oil in the unprotected waters of the Gulf make it necessary that adequate supplies of all consumable items be stored at the location to fill all requirements for at least ten days or two weeks during which time heavy seas might make it impossible to unload barges or supply boats. However, when circulation of drilling fluids is lost, or when a well begins to blow mud from the annulus, it would be difficult to determine accurately what would constitute a ten-days' supply of dry mud or weighting material.

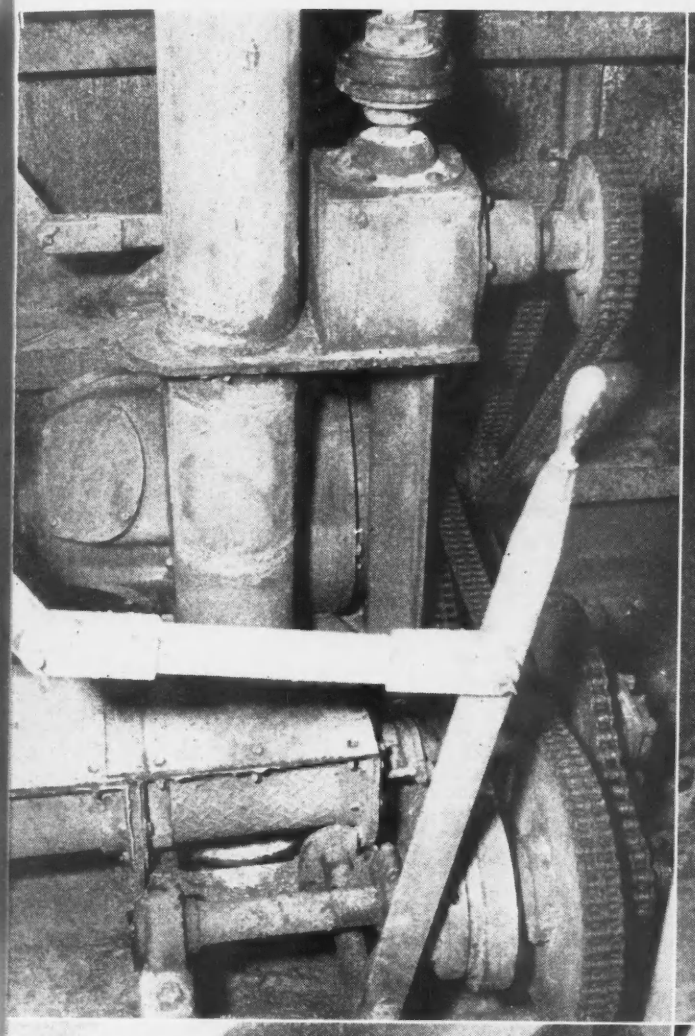
For reasons stated, a maximum storage capacity, in keeping with available space and balanced over-all design, was provided on The California Company's S-21, converted LST which is self-propelled and currently is in operation in the Bay Marchand field about four miles off the coast of LaFourche Parish, Louisiana. Bulk cement storage compartments (or bins) are built next to the "skin" or outside wall of the ship on the port side just forward of the bridge. Bulk mud storage compartments are located next to the skin of the ship on the starboard side immediately forward of the number one hold.

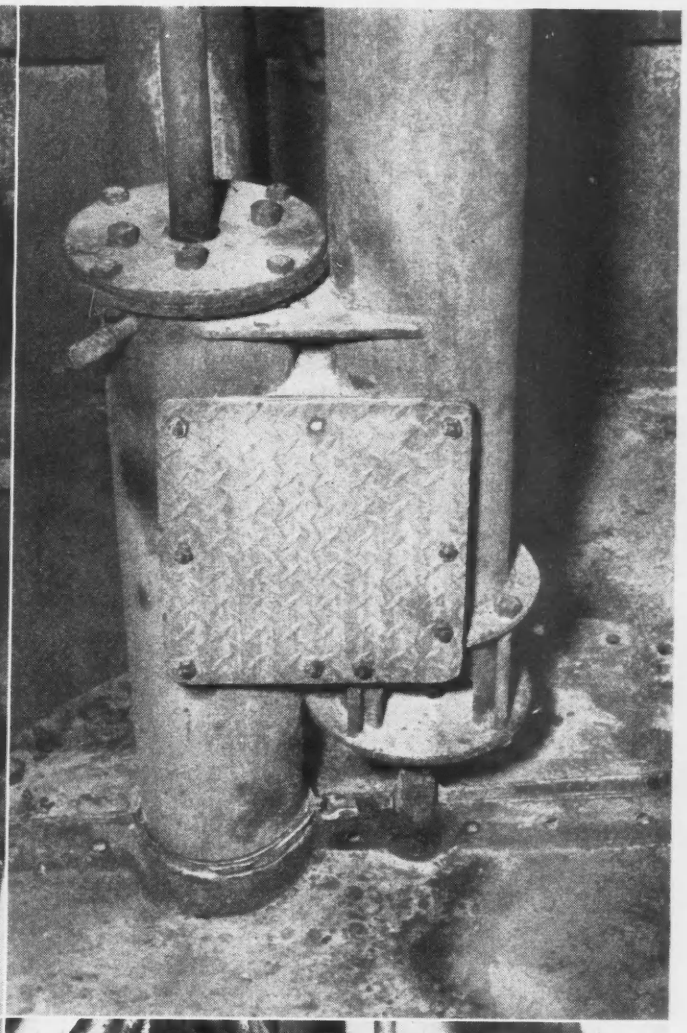
Bulk Mud Facilities

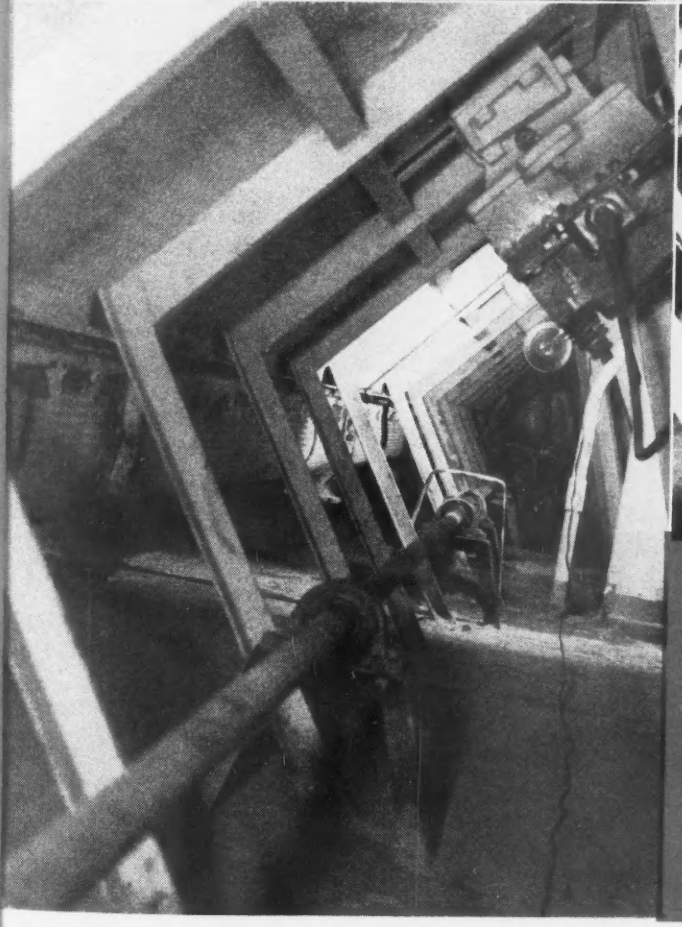
Bulk mud weighting material storage is divided into two large compartments, 48 feet in length and extending from the main deck, which serves as the top of the compartment, down to the fourth deck 24 feet below. Since the steel hull of the ship provides one side of these storage bins, it was necessary only to add two sloping walls of quarter-inch steel plate. A cross-section of the mud storage compartments is shown. Total capacity of both mud storage compartments is over 10,000 sacks of dry material.

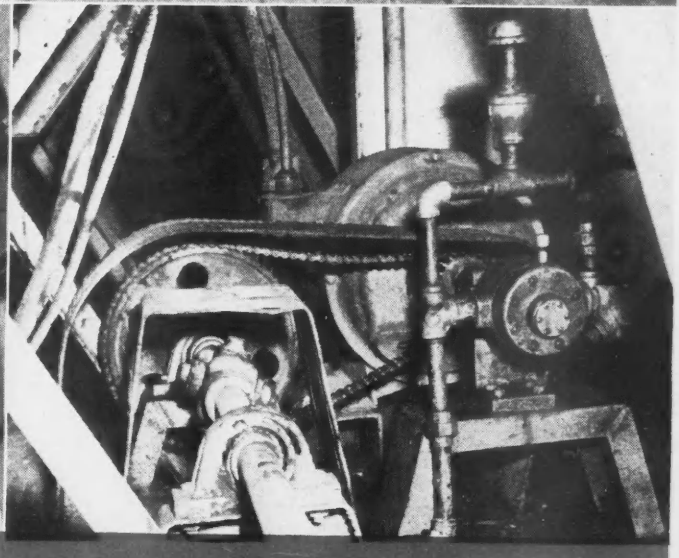
Since dry mud and mud weighting materials are not yet available to offshore rigs in bulk, it is necessary to transport these items to the locations in sacks which are loaded on deck of the tenders. Roustabout crews working on daily shifts dump the contents of each sack into two water-tight manhole openings which feed into the two storage compartments. While this practice may appear as a disadvantage upon first examination, it does permit the crews to dump the dry materials into storage during good weather and at normal working speeds. With large quantities of mud available on short notice, it is possible to mix at continuous high rates by means of mechanical devices. In this manner, much of the waste can be eliminated which normally would be expected during emergencies when large volumes of mud and mud weighting materials are required. Also avoided is the human fatigue element under such conditions.

To insure a continuous flow of dry mud materials into the long screw conveyor, the bottoms of both bins were sloped so that the included angle formed







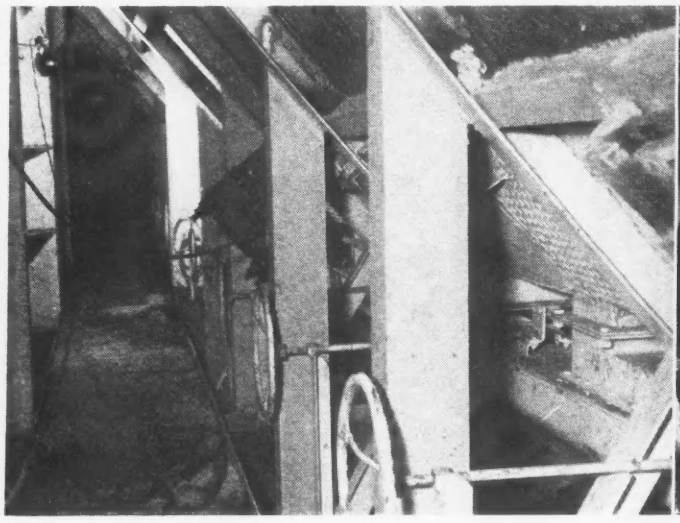


TOP LEFT: Electric prime mover and gear train which drive both horizontal conveyors.

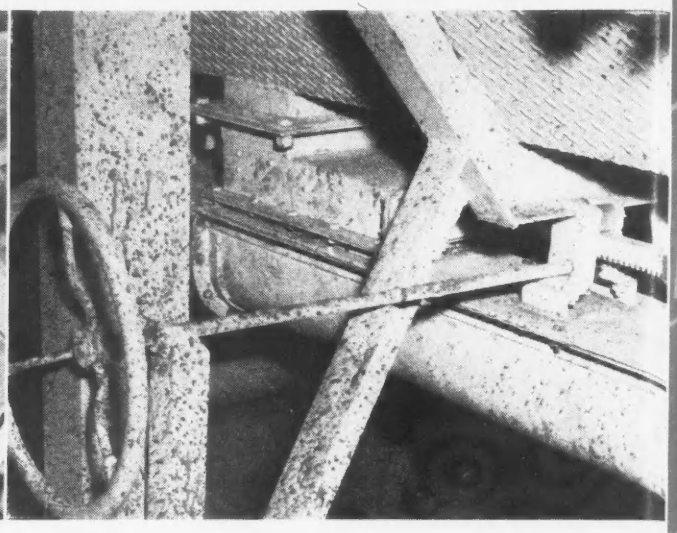
RIGHT: Conveyor transfer point located on third deck, where dry materials are transferred from one vertical shaft to an offsetting shaft for further lift to second deck.

BOTTOM LEFT: View taken below bulk cement storage bins. Screw conveyors located at apex of sloping walls of bins are driven by external power shaft.

ABOVE: Electric motor and chain drive which powers the long conveyor, located at the mid point of the bulk cement storage bins.



Passageway alongside the 48-foot bulk mud weighting materials storage bins. Each handwheel controls a dump baffle which permits the mud to drop into the screw conveyor located at the apex of the sloping bins.



Closeup of dump baffle and controlling handwheel on one of the 12 storage bins. The baffle itself is merely a rectangular blank steel plate attached to a horizontal steel bar containing gear teeth on its lower side.

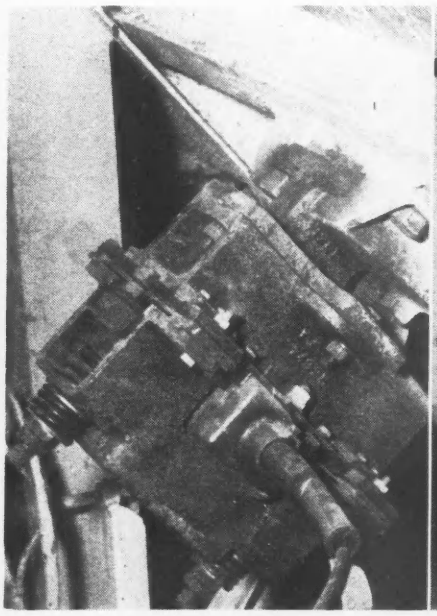
by both sides was about 80 degrees. An electric syntron vibrator which beats the inboard sloping bottom further aided in moving the dry mud into the long screw conveyor located at the base of the V-bottom. This vibrator was mounted directly on the storage bin wall at the forward end of the after mud compartment.

In the V-shaped bottom there are 12 rectangular openings into a separately-enclosed screw conveyor which moves the dry mud to the after end of both compartments. This conveyor is mounted on the storage bins at each of the 12 openings by a dump baffle housing which is shown in the closeup. Inside the housing is a flat, blanked steel plate which covers the opening into the conveyor. The baffle is controlled by a handwheel which is geared to a rack-toothed stem attached to the baffle. It is entirely manual, permitting the operator to select the amount of dry mud to be fed into the conveyor.

A 15-horsepower electric motor provides the motivating power for the screw conveyor. A sprocket and gear train give the required speeds. An open clutch controls the operation of the gathering screw conveyor on the bottom of each compartment, while the vertical lift conveyor continues to rotate as long as the prime mover is turning. In this manner, the vertical conveyor shaft can be cleared of all dry materials after each job to prevent clogging the shaft.

The vertical conveyor housing is mounted to one side of the horizontal conveyor so that dry materials will be dumped into it. In order that the dry mud weighting materials do not pack in the vertical lift from the fourth deck to the second deck, the lift was divided at the third deck. This division of the vertical lift was made possible by twin screw conveyors. One screw conveyor lifts the dry mud to the deck plates of the third deck where it is transferred to a parallel screw conveyor which continues the lift up to the second deck for discharge into a conventional mud hopper.

With such a system, the mud pump operator or mud man on the floating tender can easily add large quantities of weighting materials to the sump pits without the aid of a large crew. The auxiliary mud pump is used to circulate mud through the mixing hopper and back into the pits. The system was designed to handle 360 sacks per hour.



Syntron electrical vibrators beat the sloping sides of the bins to facilitate the flow of dry weighting materials into the horizontal conveyor.

Screw conveyor discharges dry materials on the second deck into this mud hopper where they are added to the drilling mud.

Handling Bulk Cement

Storing and handling bulk cement aboard a floating drilling tender at sea offer more complex problems than are incurred with dry mud materials. This difficulty stems from the adverse effect of dampness upon the flow characteristics of dry bulk cement. Subjected to moist air, bulk cement will, in time, absorb moisture and form lumps that clog the screw conveyors that move it from storage to mixing hopper. Because of this condition, original attempts to handle cement in bulk were unsatisfactory. Experience has shown the way to a satisfactory manner in which cement can be handled in bulk just as it is handled in bulk satisfactorily on shore. Because of the extreme dampness over the water, it was necessary to dry the

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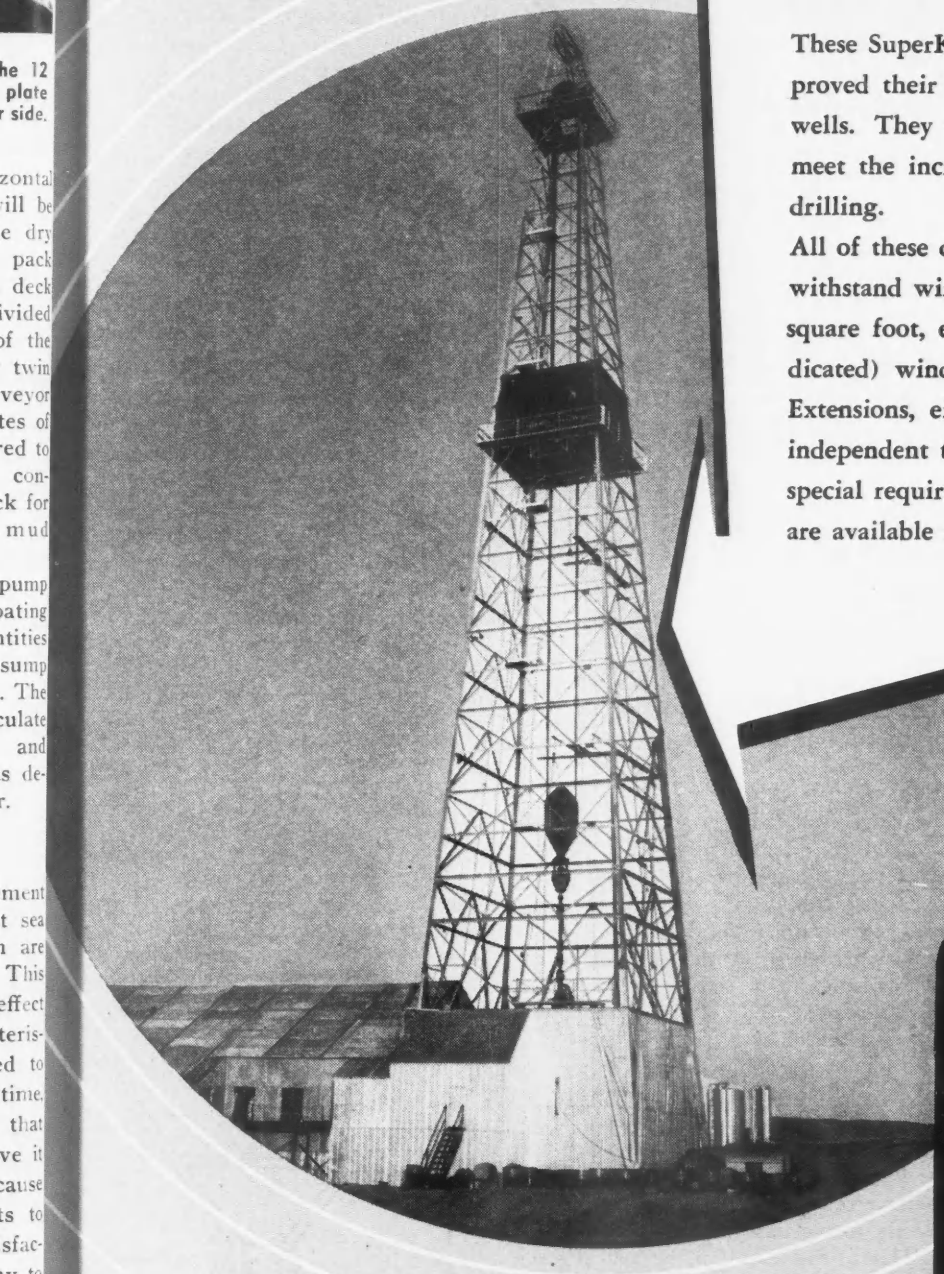

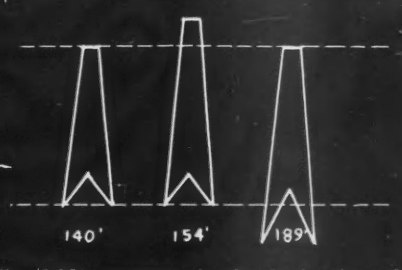

The 140' structure is the basic size of these SuperKAY's. The 154' is made by adding to the top of the 140', while the 189' is made by adding to the base of the 140' structure.

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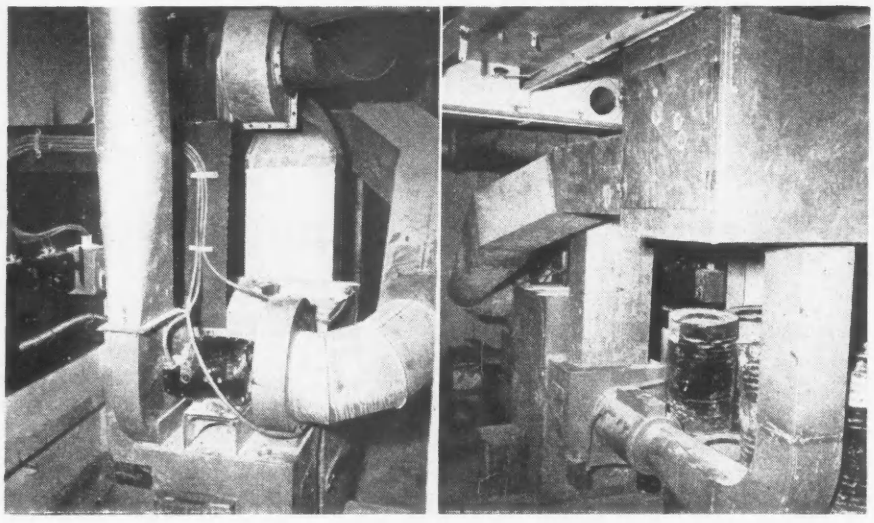


Electrically-heated de-humidifiers using activated alumina remove moisture from air which is continually forced into the bulk cement storage bins to prevent hardening.

air existing in the bins before and after taking on a load of bulk cement.

The outboard walls of these cement storage compartments extend from the main deck down to a point slightly above the second deck where the bottom slopes downward to the third deck. The included angle of the sloping walls is approximately 78 degrees. Construction of the bulk cement storage compartments is similar to that of the mud storage compartments. There are five bulk cement storage bins, with a total capacity of 4077 sacks. Over-all length is 68 feet, four inches. The ship's fan room occupies an offset room on the inboard side of the cement storage, which is located on the port side of the ship. A typical cross-section of the cement compartments is shown in schematic form with major dimensions given.

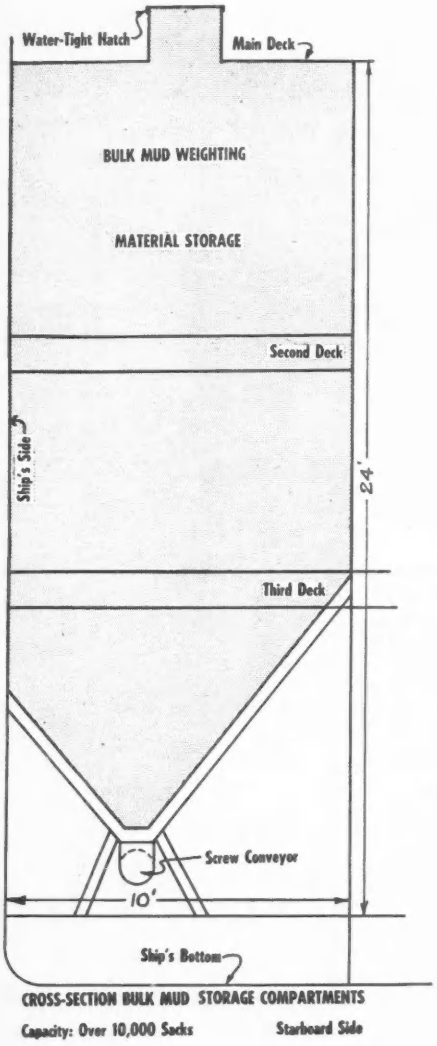
Loading cement into each of the five compartments is similar to that of loading the bulk mud. Individual cement sacks are placed on deck where the roustabout crews cut them and dump the cement into one of the five watertight hatches extending above the main deck. This loading operation is performed in good weather to minimize entrance of moisture into the cement compartments.

The moisture problem has been overcome by an electrical dehumidifier which continually circulates warm, dry air through each compartment. This process continues regardless of whether or not they contain cement so as to insure a moisture-free storage at all times. Electric syntron vibrators beat the sloping sides of each bin to facilitate the flow of dry cement into the helical screw conveyors which are mounted directly to the base of the V-bottom.

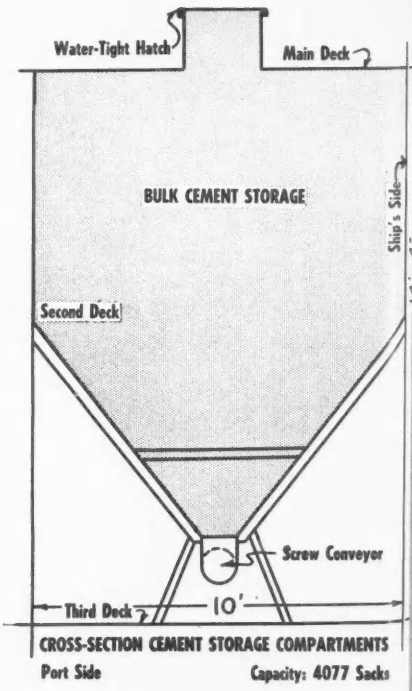
Due to the length of the helical screw conveyor (68 feet), it was necessary to drive the shaft from both ends of the compartments. A 15-horsepower direct-current electric motor powers the conveyor from a point midway the length of the storage bins. Power is transmitted to each end of the conveyor by an externally-supported shaft. The helical screw, ten inches in diameter, extends the entire length of the compartments and is fed by hydraulically-controlled baffles located inside the individual bins. Any one, or combination, or all five bins can be opened by the hydraulic system. The opening element consists of a two-way hydraulic cylinder. Pressure necessary to open and close these baffles originates from a rotary gear-type pump driven by the conveyor motor. Speed of the conveyor and intensity of beating of the bins are controlled by rheostats located at the dry cement discharge where the hydraulic control valves are also situated. Cement is mixed in the conventional manner, and picked up from the hopper by a specially-designed offshore cementing unit. These centrally-located controls make it possible for one or two operators to provide dry cement at a design rate of 1200 sacks per hour.

A Step Ahead

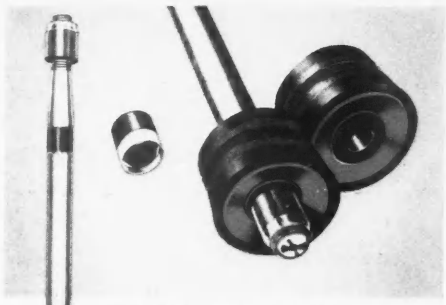
Undoubtedly, as other drilling tenders are constructed or revamped, improvements will be made upon the equipment described. These methods of handling and storing bulk cement and drilling mud represent vast improvements over former methods of hand-mixing these materials sack by sack. As each new well is drilled on the Continental Shelf of the Gulf, new experience gained will prove useful in the development of other labor and time-saving methods. The ideas described are a step ahead in reducing the tremendous cost of searching for oil beneath the open sea.



Schematic cross-section through bulk mud storage compartments on the ship's starboard side.



Schematic cross-section through bulk cement storage compartments on the ship's port side



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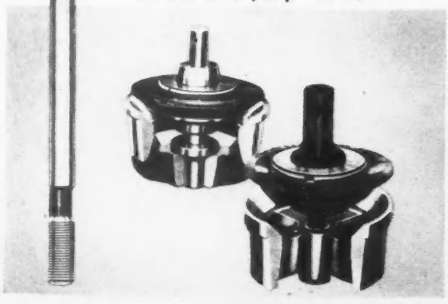

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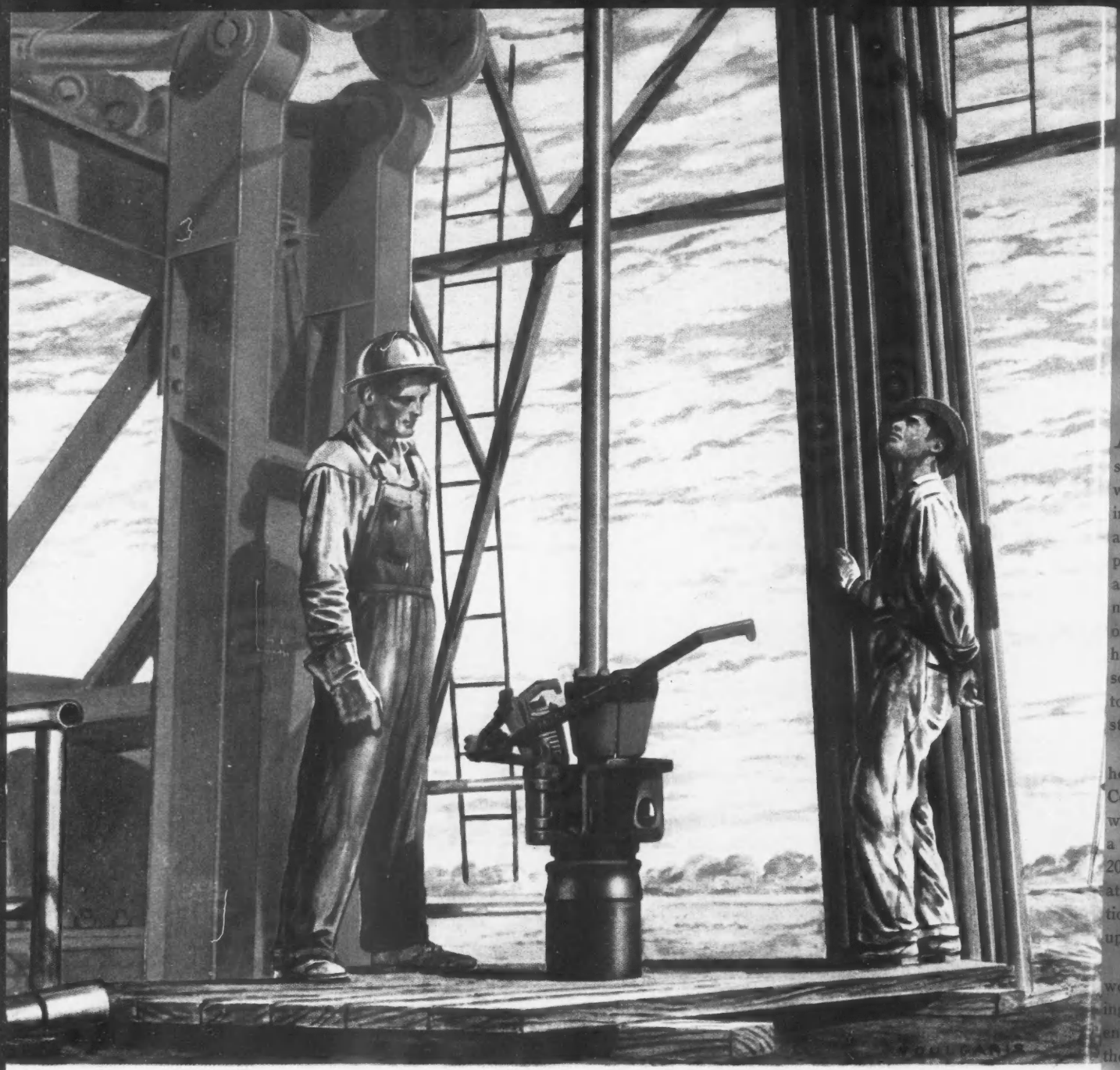
G-206-A



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Hot Foot

Frees Cemented Pipe

A STRING of 2551 feet of hard-to-get seven-inch, 20-pound cemented casing was successfully recovered from a well in an eastern Oklahoma oil field after a service company engineer literally applied a "hotfoot" to the casing seat by adapting a dump bailer process ordinarily used for the removal of aluminum or drillable pipe sections. The method had never been tried before but it proved so successful in effect that it is likely to be tried again under similar circumstances.

The well is in Creek County, Oklahoma, and belongs to the Curtis Oil Company of Sapulpa, Okla. It was drilled with a No. 3 standard cable tool rig to a total depth of 2708 feet. Seven-inch, 20-pound casing was set and cemented at 2551 feet above a non-productive section. However, the cement only came up 40 feet on the outside of the pipe.

It was then decided to deepen the well to the Wilcox sand. Upon attempting this, a very prolific water sand was encountered from 2735 to 2785 feet and the hole filled to 900 feet with salt water. Several unsuccessful attempts were made to plug off this water and drill back through. Failing in this, the only recourse seemed to be to set a liner and drill deeper with a four-inch hole, or to somehow pull the casing and re-set it below the water sand.

After several unsuccessful attemps had been made to pull the pipe the operator turned to the service company for assistance and the field engineer suggested the "hotfoot" treatment. Since the process used for removal of aluminum pipe sections generates heat producing a temperature of over 1100° F., and knowing that cement will crack at temperatures ranging between 600 and 700 degrees, it seemed logical that this process should crack and loosen the cement and perhaps allow the casing to be pulled.

The well was plugged back to 2553 feet, two feet below the shoe, with gypsum cement, and bailed dry. Caustic-nitrate solution was then made up to fill the bottom 40 feet of casing or to the height of the cement around the pipe. This solution was placed with a steel bailer. It was proportioned to dissolve a discarded 20-foot piece of 3½-inch outside diameter aluminum bailer.

A bronze male coupling and bail was attached to the aluminum section, lowered to bottom and given 3½ hours to react.

The reaction between the discarded aluminum section and the chemical solution was quite violent and easily discernible at the surface. As expected, a large amount of ammonia gas was generated.

Finally, the casing was pulled up to maximum stretch and then dropped. After repeating five times the pipe came free and was then easily removed from the well. It was then re-set below the water zone and the well was drilled deeper with a full size hole.

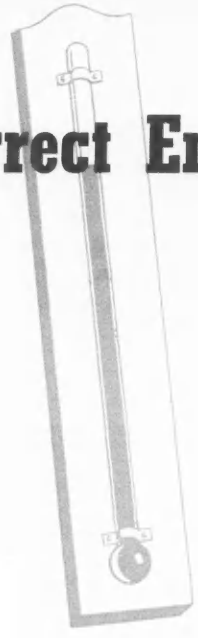
The job got the operator out of a bad situation. However, there can be a limit to the height of cement that could be removed, but comparable cases are simple to try.

Adaptation of a dump bailer service used to remove aluminum pipe enabled an Oklahoma operator to pull 2551 feet of seven-inch pipe in unique "hotfoot" operation never before attempted.

Photograph courtesy Halliburton Oil Well Cementing Company.

Maintaining Correct Engine Temperatures

By A. J. BOYER
President, Process Solvent Company



OPERATING costs and engine repair bills can be kept at a minimum if engine temperatures are constantly maintained within the limits in accordance with factory specifications.

There are a number of factors which result in engine overheating and it is therefore essential to check the cause of the trouble. Engines which constantly overheat are subject to severe damage and loss of efficiency. Broadly speaking, the prime factors contributing to overheating are scale accumulation and rust corrosion in the circulating system. These conditions must be kept at a minimum since engines are designed to operate efficiently at temperatures in relation to operating factors about the power plant. Sizeable variations from the correct temperatures will result in loss of power, waste of fuel and even more serious complications.

Engines that have been operating through the winter should have the cooling system thoroughly checked and cleaned in the spring or as soon as the freezing weather is past. This is essential because the condition of the cooling system has an important bearing upon the formation of oil varnishes, causing pistons and valves to seize, due to extreme crank case temperatures. In both laboratory and field tests it has been conclusively shown that if the motor block is cleaned thoroughly with a scientifically compounded cooling system cleaner, it will not only dissolve the scale from the motor block but will prevent valve sticking and arrest varnish formation.

With the scale removed from the inside walls of the water jacket the water in the cooling system can once more draw the heat from the block assembly with approximately the same efficiency as when the unit was new. This will keep the cylinder walls and valve guides near the temperature for which they were designed. Once the cooling system is functioning at safe and efficient temperatures it will protect bearings, prevent cracking of heads, valve seats and the blocks themselves. Figure 1 shows a cracked cylinder head caused by an overheated engine which resulted in a costly shutdown on a drilling operation. This could have been avoided by following the simple precautions outlined. Figure 2 shows scale encrusted cylinder block. Scale has collected inside water jacket.

When using a cleaning compound the field man should not merely dump the contents into the engine radiator and hope that it will do the job properly. He should carefully read and follow instructions which specify its uses and the percentages in which the compound should be used. Many field men follow the harmful practice of bringing the cleaning compound to a boil. This is unnecessary as overheating causes damage to the engine and a good cooling system cleaner should do a good job at normal running temperatures. Under no circumstances should the field man cover the radiator or permit the heat to build up past normal running temperatures.

Replacing Hose

Hose that has become swollen and spongy should be replaced as soon as possible. New clamps should be used since the old ones are frequently corroded and, if necessary, a non-hardening seal rather than a shellac should be used to coat the hose. The entire cooling system should be checked for leaks as the removal of rust and scale will uncover pinpoint holes in the radiator caused by electrolytic action. A liquid stop leak may seal tiny holes but bad leaks may entail removal and soldering of the radiator core. If the water pump leaks or indicates imperfect functioning it should be repaired or replaced before the engine is placed in operation. Field men should not depend upon a water pump lubricant alone to stop all leaks around the packing gland of the water pump.

If the water in the locality where th engine is in operation contains corrosi elements, a good rust inhibitor wat pump lubricant will arrest electroly action as well as lubricate water pum shafts, and should be used with packle water pumps. Such a lubricant shou be used only after the cooling syste has been put back into good mechani condition.

Since cooling system failure and co sequent overheating in drilling and oth type of engines are the result of vario causes, it is necessary to ascertain pr marily which cause is producing th trouble.

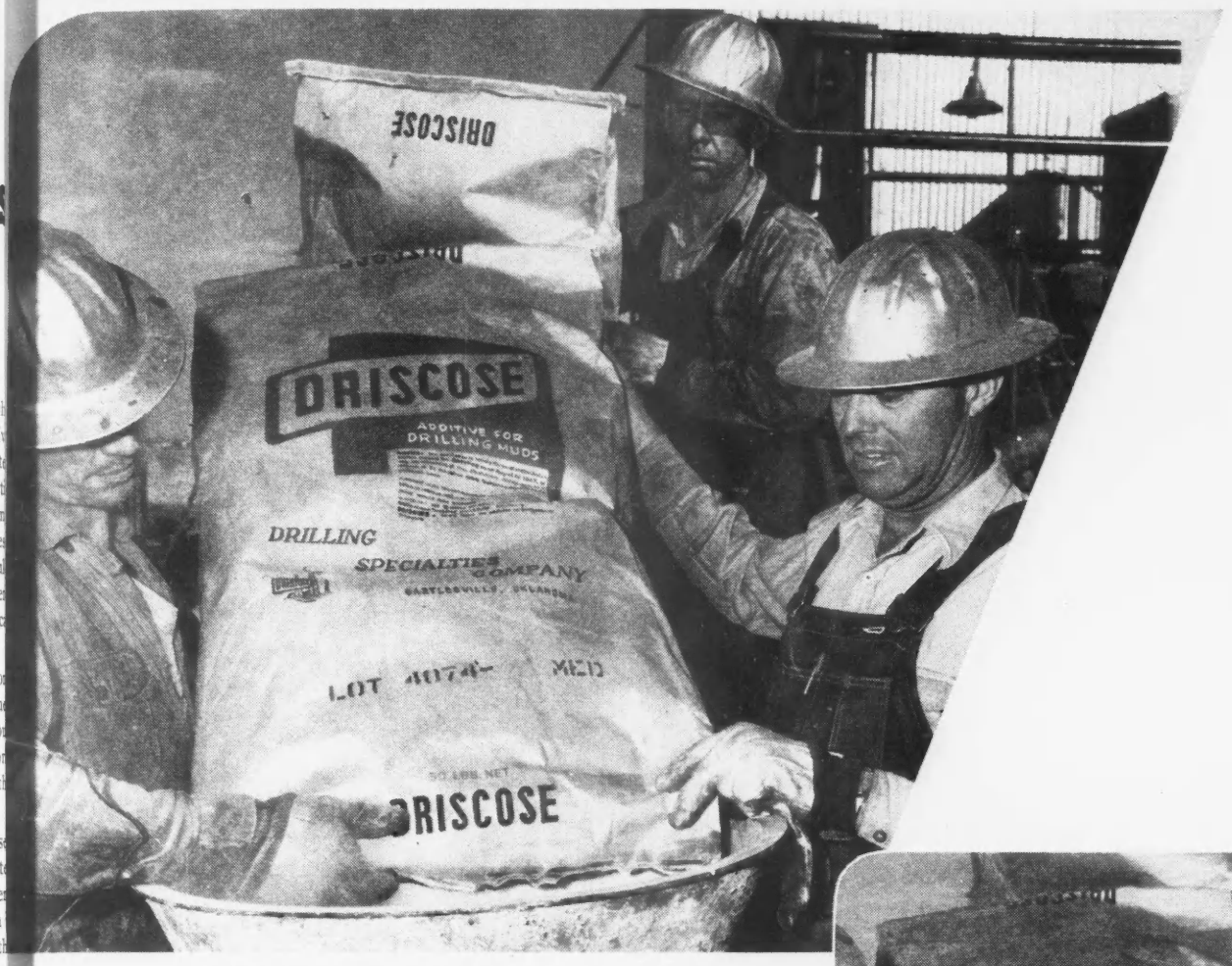
First, a check should be made to s if the pump is circulating the wat properly and constantly through the e gine block. Next, in order to ascertain the radiator core is stopped up or if th pump is not functioning properly, chec to see if the water is piling up on t of the radiator pan and dischargin through the overflow pipe.

There are other types of radiat cleaning jobs that can be distinguishe by merely looking into the radiator. may be that so-called "varnish" has s up over the tubing of the core and is n permitting the heat to escape from t radiator, even though the core may open and the water circulating proper

In the following examples the writ will briefly classify the various con tions which make the cleaning of t radiator necessary.

Example 1. Standard scale job. Th type of trouble is more prevalent areas where the water is corrosive. removing the radiator cap the field m will note the muddy color of the wat To overcome this condition a scale so ent cleaner is recommended. The d coloration of the cooling water is caus by the scale building up around t cylinder walls of the block, flaking and becoming deposited in the top the radiator, thereby stopping circulati and causing the engine to overheat.

Example 2. "Greaser" radiator. Th condition is the result of excessi amounts of oil and grease contaminati the cooling system. As a rule this tro ble has been caused either by bad he gaskets or by the use of excessive qua



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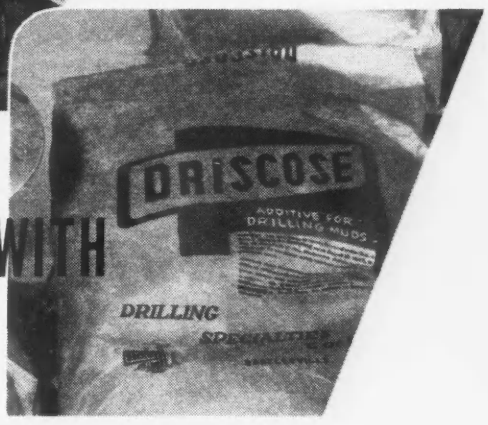

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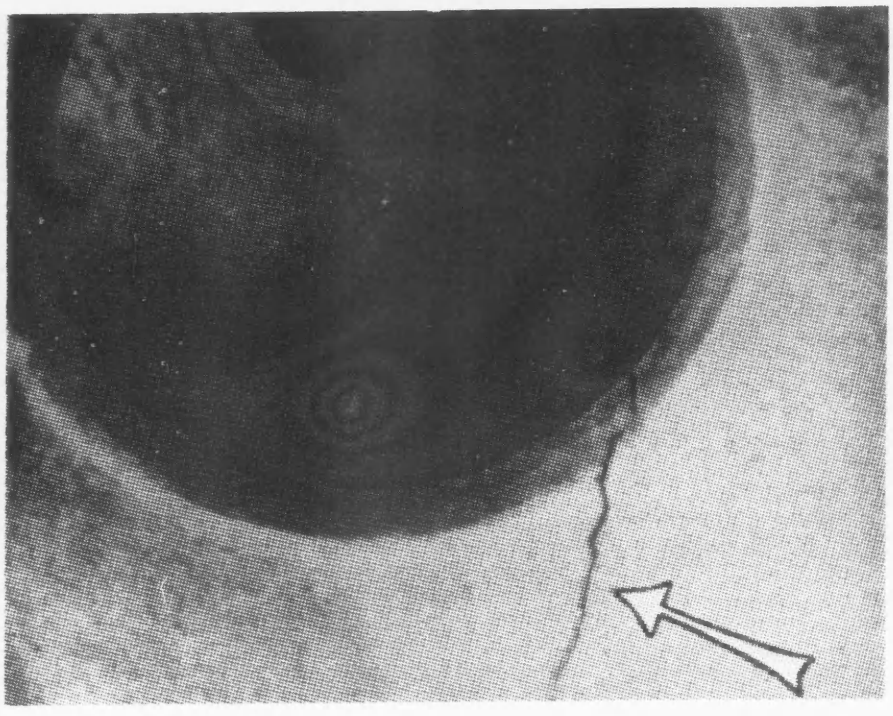


FIGURE 1. Cylinder head cracked by overheated engine.

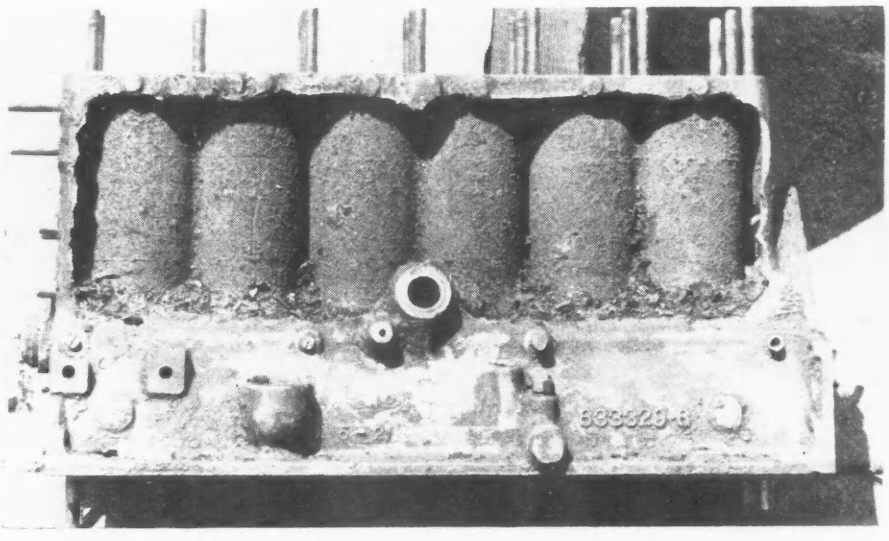


FIGURE 2. Scale accumulation inside water jacket due to the use of corrosive water for cooling and lack of proper attention in cleaning out engine cooling system.

FIGURE 3. So-called "permanent anti-freeze radiator" showing radiator core covered with "shellac." This condition is generally caused by monoxide gas mixing with the anti-freeze solution in an engine radiator.

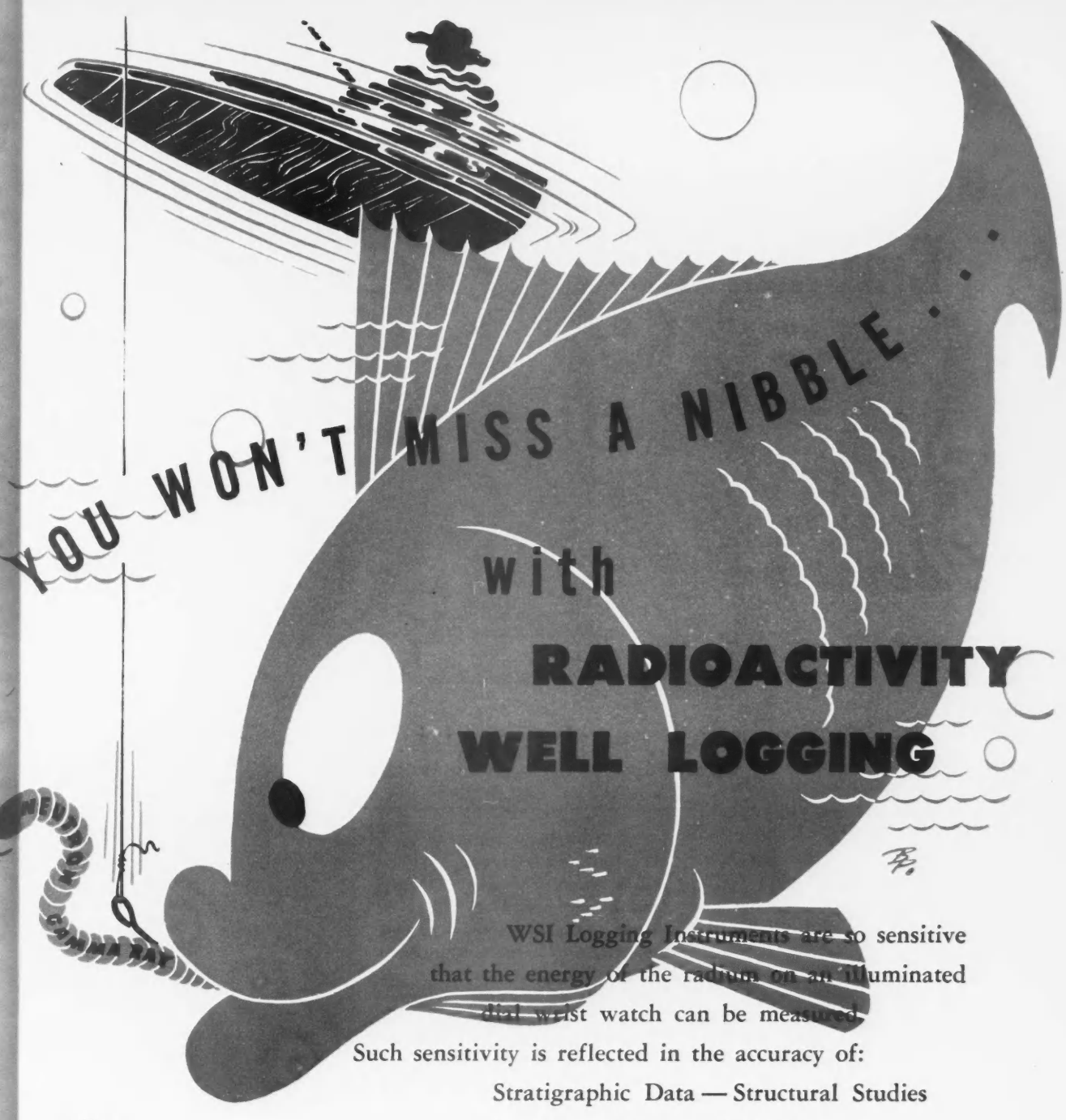
tities of grease in the water pum causing the grease to pile up on top the radiator core. A radiator flush c sisting of a phosphate solution or caus is recommended to cut the grease in radiator, followed by a scale solvent clean the engine block as well as radiator. This is important as the bl feeds the radiator and a bad condit in the block can cause radiator stoppa

Example 3. "Permanent type a freeze radiator." This condition can easily recognized because the radia core will have the appearance of be covered with shellac (Figure 3) and water in the radiator is red in color phosphate cleaner should be used in cleaning system when this trouble present. There are several manufactur who make and distribute this t cleaner. No neutralizer is needed wi a phosphate cleaner is used, but it very important to use a neutralizer a a caustic has been used in the cool system. In treating this condition engine should be brought up to a t perature of 180° F. and should be ma tained at this temperature for appro mately one hour. The engine should t be thoroughly flushed with fresh wa The phosphate solution should be moved from the engine at a temperat of about 160° F.

When this condition is present offending formation is much like rub or gum which will dissolve in a ph phate solution at the above temperat A circulating pump should be used safety as this solution must be remov from the engine while hot. If it is p mitted to cool it will set up again plastic. Another cause leading to same effect might be the result of a m ture of monoxide gas which g into the water and the anti-freeze s tion thus causing the anti-freeze "hang" on the metal. This may be solved but proper temperature is important factor since this material set up around 120° F. and tends become solid.

An important fact often overloo by field men when engaged in clean drilling engine cooling systems is t while both phosphate and scale rem ing solutions are essential in the op tion, the solutions should be used proper sequence. The phosphate solu should be used first; then the scale s ent. These two should never be t together as they act directly oppo and tend to neutralize each other.

In conclusion the writer wishes point out that with oil field drilling gines ranging in price from $5000 $15,000, it pays the operator to see t that the cooling system, which means much in efficient operation, be prope maintained at optimum and that i men be instructed to check thorou at least once a year.



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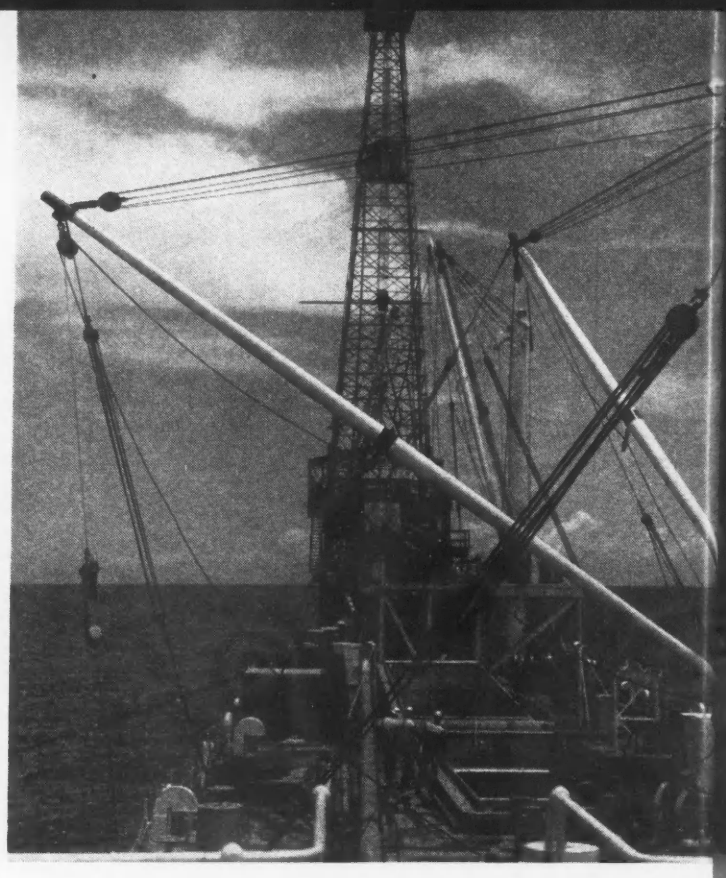
Safety Emphasis

In Offshore Operations



Looking toward the drilling platform from the S-21 in The California Comp Bay Marchand field.

By J. B. GEORGE
Safety Supervisor, The California Company

THE AUTHOR discusses the hazards at an offshore rig, and describes methods adapted for minimizing personnel transfer at sea. He stresses the need for proper training and appreciation of the problems to be met, and draws a parallel between seagoing and land operations, with special emphasis on the precautions taken against fire.

SURPRISING as it may seem, in spite of the many new hazards encountered, the accident and injury rate in offshore operations in the Gulf of Mexico is not considered high by most operators when compared with ordinary inland drilling and producing activities. In fact, the accident experience thus far, in this new venture, is just short of amazing. Through the first six months of this year, the largest operator in the Gulf had sustained only one disabling or lost-time accident. Many of the other companies, including ours, have not been this fortunate, but by and large, the over-all operation from an accident-free standpoint is one of which the industry can well be proud.

The reasons advanced for this unbelievably low accident frequency accomplished to date are very controversial. One of our superintendents, recently stated emphatically that, "We, as well as everybody else, have just been plain damn lucky." To this I agree up to a certain point, but, on the other hand, there is more justification than Lady Luck.

First of all, I firmly believe that more thorough engineering and supervisory planning have gone into the Gulf of Mexico structures and equipment than have ever before gone into any drilling and producing project in the oil industry. The engineering research done prior to jobs going on the drawing boards was and still is phenomenal. Before the first structure was built, engineer obtained the highest wind velocities and seas ever recorded by the U. S. Weather Bureau in the Gulf. Bear in mind they obtained the highest, not the average, and engineered their structures with a safety factor commensurate with the worst conditions that could possibly develop during Gulf Coast hurricanes and high seas. Practically all engineering has been done along this same high level. Along with this, the operating supervisors in charge were just as careful to see that no more than the usual chances be taken by employes because they were well aware of what the circumstances would be. In addition to the above, Management has been just as thorough and co-operative so far as expenditure, for the best equipment and ample manpower, was concerned. fact everyone has contributed ju little more and approached the situ with considerably more caution will be found in the average inland velopment.

In spite of good, thorough engi ing, close supervision, two-way communication, and Management' sistence on nothing short of the the hazards faced daily by the off roustabout, roughneck, switcher gauger are far greater than those countered on land or in the marsh

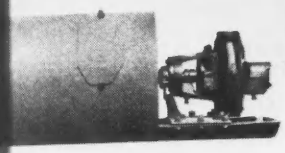
The three phases of the oper extending more than the usual oil hazards are as follows:

1. Transportation and transfer of sonnel from crew boats to L and structures during high se
2. Transporation, handling and age of vast supplies and mat in a limited area.
3. Producing, storage and transp tion of oil after it is disco before permanent producing ties can be installed.

Transfer of Personnel

By far the most hazardous pha the operation encountered so far a most companies has been one th almost as old as the sea itself transfer of men during high seas crew boats to LST's and platform

CONDEMNED



HOW MUCH OF YOUR BOILER FUEL AND FEED WATER IS GOING THE SAME WAY?

All conservation-minded producers and almost all conservation bodies have condemned the flaring of gas as a *wasteful and outmoded method of operation.*

Outmoded methods of firing oil field boilers can be just as wasteful and costly. Firing by flame inspection with open boiler doors invariably results in excessive fuel and water consumption, erratic steam pressures, flue scaling and warping.

To eliminate this waste and damage, and to modernize firing methods to conform with their other drilling equipment, more and more operators are installing Owen "Forced Draft" Firing Systems on their boilers. These systems lower the water and fuel requirements for each boiler . . . sharply reduce flue scaling and warping . . . assure a constant, uniform supply of hot, dry steam at all times. They are the *modern* method of firing oil field boilers.

Owen "Forced Draft" Firing Systems are particularly advantageous on offshore jobs, where the cost of every inefficiency and every repair is multiplied manyfold.

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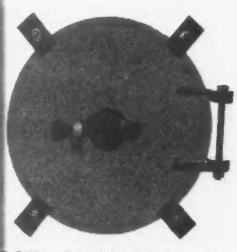
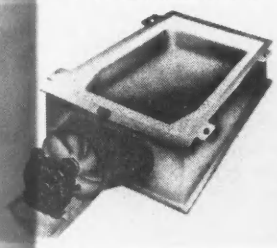
Save water and fuel through perfect combustion without requiring steam jets and by eliminating need for stack blowers.



CLOSED, PRESSURE-TIGHT DOORS

Save fuel by retaining heat inside firebox; prevent flue scaling and warping by eliminating cold drafts; increase efficiency by preventing cold spots in firebox.



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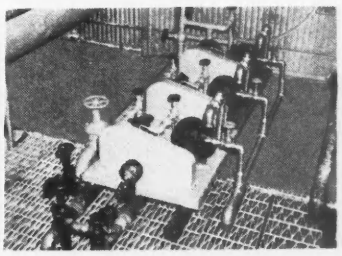

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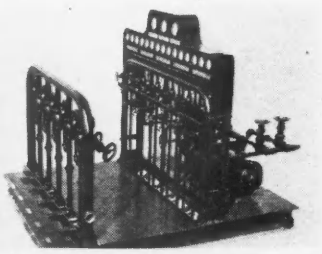
Assure a steady flow of fuel when firing with oil. Automatically maintain constant supply pressure for highest efficiency and prevention of fouled burner tips.



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our company alone, about eight different methods of transfer, costing thousands of dollars, have been tried, and after each trial, we went back to using the Jacob's ladder which has come to be standard equipment with most operators at the present time. Transferring personnel from crew boats, usually 104-foot converted Army crash boats, to a structure has been accomplished with a certain degree of safety by one company utilizing a ball and socket type swivel on both ends of a ladder that would rise and fall with the sea. But after the sea reaches 5½ to six feet, I am told that this method is abandoned for the Jacob's ladder. In going from the crew boat to an LST or vice-versa, it becomes even more hazardous since both the crew boat and LST are rocking from the effects of the lashing waves. The safest practice of personnel transfer we have enjoyed to date has been to suspend two strings of heavy airplane tires strung on three-fourth-inch steel line from the top of the LST to below the waterline, about six feet apart. Between these two rows of tires, Jacob's ladder is hung from the top of the LST to about three feet above the normal water line as in Figure 1. The large airplane tires help absorb the smashing effect of the boat and protect the ladder from being smashed and jerked down.

Our division operating superintendent has issued an order to the effect that no one will attempt to ascend a ladder between the tires until both ends of the crew boat have been made fast by lines tied to the LST. Life preservers are available for the men going up the ladder, but are not required to be worn since they often do not fit too well, are bulky and cumbersome, and offer hindrance to the freedom of movement required in climbing up or down the Jacob's ladder. Some personnel wear preservers while others do not.

About the Author

J. B. GEORGE, safety supervisor for The California Company, is a graduate in sociology from the University of Tulsa. He worked for a drilling contractor in the Kansas, Oklahoma and Texas oil fields before and during his college days and later was three years with Sinclair Oil and Gas Company in safety work. He is a member of the Executive Committee, Petroleum Section, National Safety Council.

In transferring to permanent type structures that are resting on piling, considerably more safety is to be had since you only have one moving object to worry about plus the fact you are stepping to a platform or walkway that is solid. On our producing platform at Bay Marchand, our Gulf Coast Division engineers have designed and had installed a heavy duty 36-inch walkway inside the piling at a height equal to the normal deck level of the crew boats. On the back side of this 36-inch walkway is a 42-inch well-braced handrail to keep the men from falling off the back side the walkway into the sea (Figure 2). By placing the 36-inch walkway inside of the piling, it is not continually being smashed by the surging boat. Life jackets are worn by employes during this transfer and after the men are safely on the structure, the jackets are returned to the crew boat.

Material Handling

Material transfer, handling, and storage is a continuous phase of the work being carried on aboard an LST, st ture, or barge. Mud, drill pipe, ca tubing, water, diesel fuel, food an many other items required to dri oil well have to be handled at one or another from barges onto the or structure and then stored in wo order. In this process, the men are jected to many serious hazards precaution and teamwork must exercised by everyone connected the operation. Most equipment is pi up and moved by heavy duty booms electrically operated winches. In dling drill pipe, casing and tubing o LST during a heavy sea, adequate lines with sufficient men on each are necessary to keep the pipe swinging wildly, breaking equip and falling on deck. Often four two on each end, with two men on line, are necessary to keep pipe safely under control. Even on relat calm days, at least two hand should be employed. Six joints of inch drill pipe once had to be dro about 30 feet because it got out o control of just two men on one line and was about to snap the b Fortunately, everyone was able to free before the operator let the drop.

The maintenance and regular ins tion of these booms and winches **must** if failures resulting in men killed are to be averted. On our L semi-monthly inspection is carried Each boom is lowered, greased an spected with special emphasis to that pins and pulleys are pro hobbled.

Material stored on deck must be blocked or scotched to prevent r or falling on employes. This is necessary in maintaining clear aisles passageways to prevent slips and on deck.

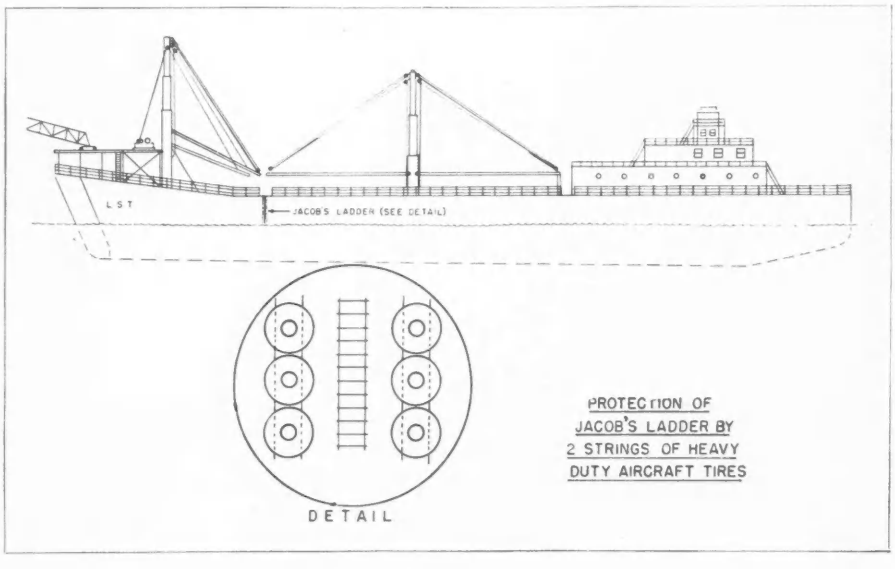
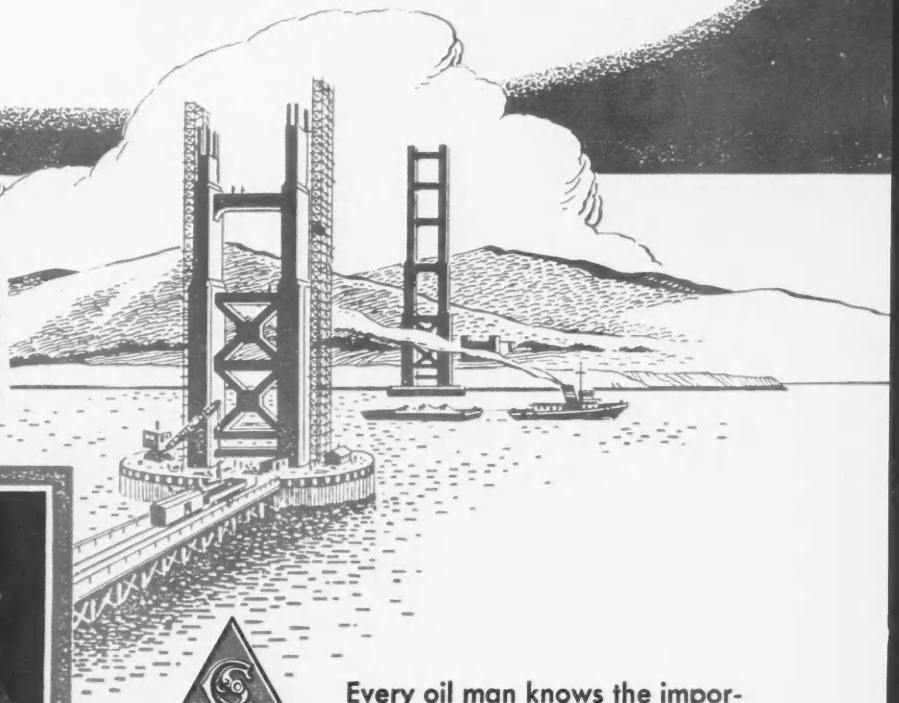


FIGURE 1

Temporary Producing Facilities

After a well is brought in at a offshore property, the temporary e ment utilized in producing and te the well before permanent facilities be installed is often hazardous fr fire as well as an accident stand The type of equipment used i course, dependent upon the pres encountered. However, in most stances, the separator is placed accessible corner of the structure a producing barge along with a tank. During this period extreme ca is necessary to prevent smoking, tying alongside, and other sourc ignition. Among the few rules th have adopted, one is that smoki prohibited at all times on the dr platform. In areas alongside the where a barge is tied with testing e ment aboard, special "No Smo

WHY DO YOU CALL IT *Casing?*



his word, so frequently used in the petroleum dustry, is a corruption of the French word, aisson," a large water-tight case or chest used laying foundations for bridges and other such uctures in deep water. It has in reality the me meaning . . . to exclude water from the illed hole.

Every oil man knows the importance of casing in drilling. And they know that *good* quality in casing and all other equipment is necessary for profitable operation.

Continental and its associated manufacturers have earned the reputation for high quality in the equipment they offer. Even as the "Green Triangle" is recognized as a symbol of *dependable*, better service.

WHERE IT GOT ITS NAME . . . If you have an unusual slant on a name commonly used in the industry, its origin and why, please send it to us. Other oil men will be interested.

CONTINENTAL

SERVING THE OIL AND GAS INDUSTRIES

THE CONTINENTAL SUPPLY COMPANY, *General Offices:* DALLAS, TEXAS

Export Division: 30 Rockefeller Plaza, New York, N. Y.

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signs are placed for the benefit of anyone working or passing through the area. As soon as the tests are completed, the producing barge is then moved out approximately 150 feet from the drilling structure. Four permanent type anchors with buoys attached are placed on each corner of the barge, keeping it away from as many sources of ignition as possible with only a gauger going to the barge once each eight hours. The production reaches the anchored barge through a six-inch buoyant rubber hose. By having the permanent type anchor attached to buoys, you can change barges with very little effort (Figure 3).

The fact that these temporary producing facilities offered a tremendous risk was evidenced when Management shut in our Bay Marchand discovery, after engineers obtained sufficient test data, until permanent producing equipment could be installed. Separators, storage tanks, pumps, etc., were set up on a separate structure a considerable distance away.

Weekly Fire Drills

The possibility of fire has been a matter of concern since the offshore operations commenced. As a result, fire drills are held weekly, as well as inspection of fire fighting equipment. A "fire bill" is placed on each LST gi specific instructions as to where t and what to do in case the ge alarm is sounded. These instruction also placed on each bunk in the qua of the ship.

Monthly safety meetings are aboard all LST's with everyone att ing, regardless of what company might be employed by. I have seen from at least six different contra company or service firms in attend The meetings are of the conference where every man has a chance to what he thinks might make the o ation safer. Many good suggestions come from men employed by contra or service firms.

The U. S. Bureau of Mines has a representative aboard each LST senting the "Magic of Fire" dem stration. At least two and someti three demonstrations were held so that men on all tours could see fine fire and explosion demonstrat Movies such as "Fighting Fire Ab Ship" and "Safe Handling of Mater are usually shown in conjunction the monthly safety meetings held in ships recreational room. First-aid tr ing courses are planned for every working at offshore locations du early fall.

Since it is necessary, at least in operations, to have men from sev different contract or service fi aboard LST's, the division operat superintendent has written a letter each firm asking that they have t employes adhere to the few rules safe practice regulations which Mana ment has seen fit to adopt.

The daily weather forecast is iss via FM radio daily at 6 p.m. to boats connected with the offshore o ation. A man is assigned the duty checking with the weather bureau ev three hours to see if there have b any changes in the weather outl Any change from the previous re to the boats is sent out via two- FM radio. These weather reports the expected or forecasted wind ve ity, wave height, temperature, rain cloudiness, etc. These reports watched very carefully by supervis and boat skippers and are used ex sively in planning the next day's wo

As stated before, the accident rat this new phase of the industry has far been good, but if it is to rem good, the continued vigilance exhib to date must not be slackened. A down, which could easily happen everyone becoming more familiar the job, could bring a wave of accid resulting in deaths that the industry not experienced since roughnecks throwing safety engineers into s pits a couple of decades ago.

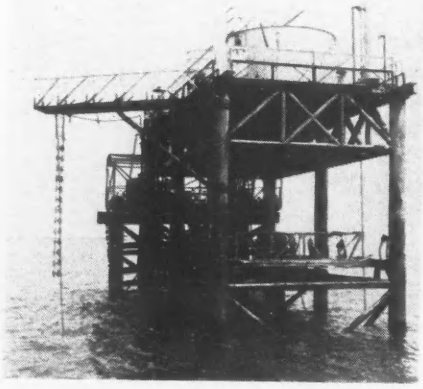


FIGURE 2 (left). This crew has just stepped from a crew boat to the 36-inch walkway inside the piling on The California Company's production platform at Bay Marchand.

FIGURE 4 (right). During exceptionally high seas, a specially designed ladder and walkway, left of photo, are used instead of the 36-inch walkway at boat level inside of the piling.

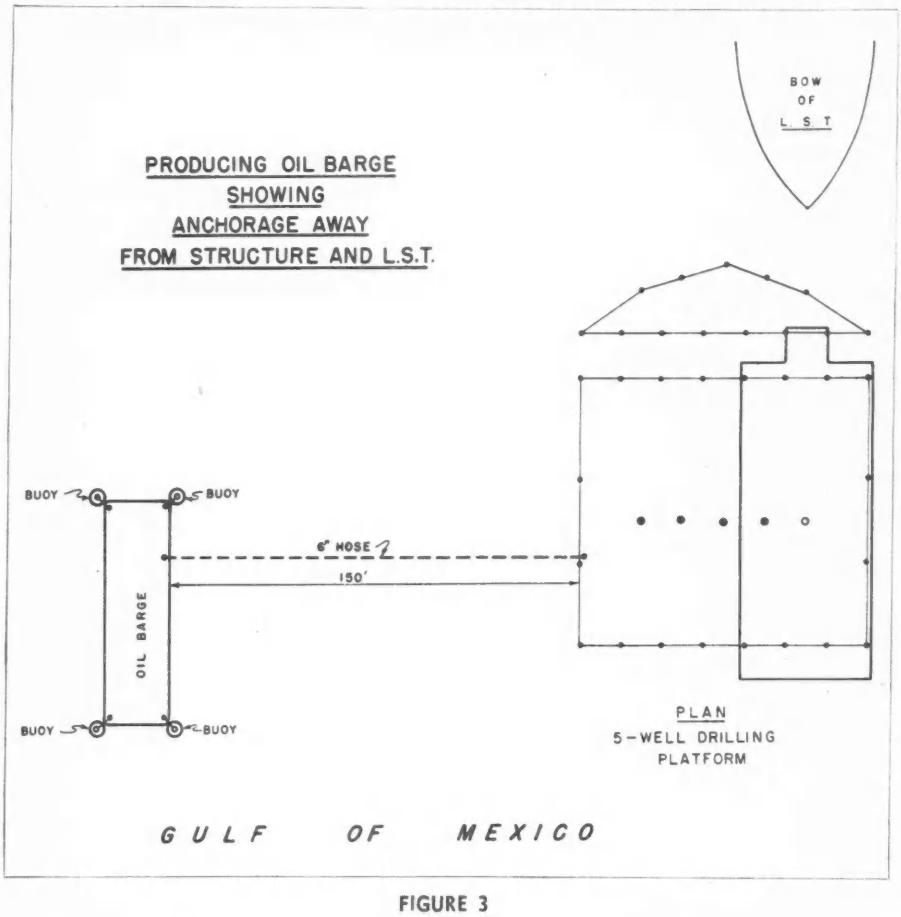
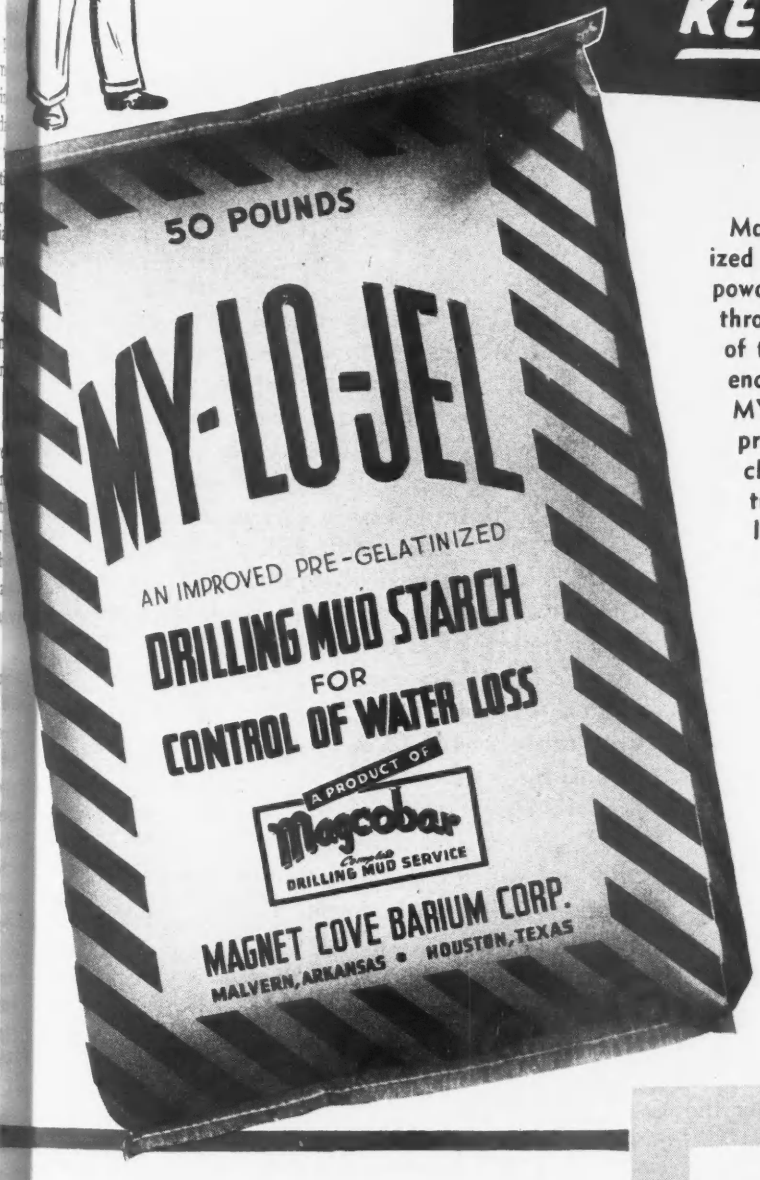


FIGURE 3

MY-LO-JEL

THE New MAGCOBAR STARCH LOWERS WATER LOSS AND KEEPS IT LOW!



Magcobar MY-LO-JEL is an improved pregelatinized drilling mud starch in the form of a free flowing powder which can be added directly to the mud through a hopper mixer. It provides positive control of the filtration properties of mud even in the presence of salt, anhydrite and other contaminants. MY-LO-JEL is a blended starch that is especially processed to produce a quick acting, tough and chemically stable plugging agent to inhibit filtration of mud. Thus, it not only lowers the water loss, but keeps it low.

MY-LO-JEL is economical to use. Two to four pounds per barrel of mud is all that is needed to impart the low water loss desired of most muds. It has a stabilizing effect on mud which often greatly reduces the cost of maintenance while drilling. Low water loss muds made with MY-LO-JEL are doing much to hold down the present day cost of drilling by eliminating strings of protection casing, preventing delays due to reaming, hole trouble and fishing jobs.

MAGNET COVE BARIUM CORP.
MALVERN, ARK. HOUSTON, TEXAS

Export Representative:
DANIELS, BECKLEY & ASSOCIATES
30 Rockefeller Plaza, New York 20, N. Y.

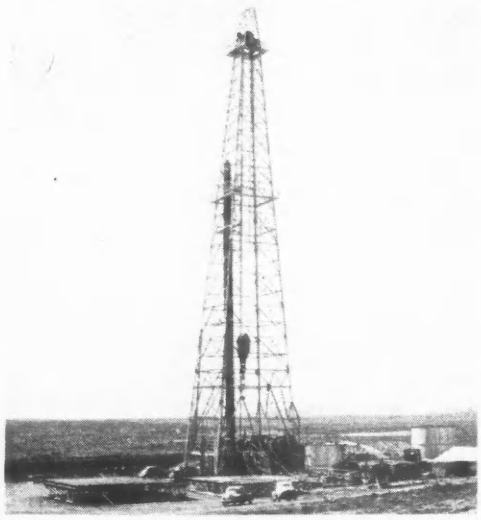
Look for this sign **WHEN YOU NEED MUD**

MAGCOBAR • MAGCOGEL • HIGH YIELD DRILLING MUD • XACT CLAY • FIBER-SEAL • MAGCO-MICA • TANNATHIN • JEL-OIL MUD • JEL-OIL "E" • SALT GEL • NOHEEV • SEAL FLAKES • MY-LO-JEL • CHEMICALS

Magcobar
Complete
DRILLING MUD SERVICE
DEALER

O-C-T C-19

...the only Casing Hanger that meets every well completion condition in a single compact model



When the "C-19" Casing Head was introduced to the industry more than two years ago, engineering tests had proved that this major advancement in well control equipment was good for long, heavy strings on 20,000' wells.

Now, on The Superior Oil Company's Pacific Creek No. 1, Sublette County, Wyoming, the O-C-T "C-19" . . . a standard head shipped right out of stock . . . has distinguished itself in service at 19,765' on the world's longest, heaviest string of casing, consisting of a combination of 32, 29, 26, 29 and 32 lb. 7" casing.

Suspended weight on this Superior record well was approximately 475,000 pounds by weight indicator reading.

Designed for quick setting and positive sealing, O-C-T "C-19" Casing Heads feature a unitized suspension and seal which greatly simplifies installation, saves rig time, and improves the safety of the completion operation because the well is closed in around the casing before blowout preventers are unflanged.

In addition, O-C-T "C-19" Casing Heads step up crew safety because the hanger is shipped assembled in a single unit, ready to install from the derrick floor, reducing hazardous work in the cellar.

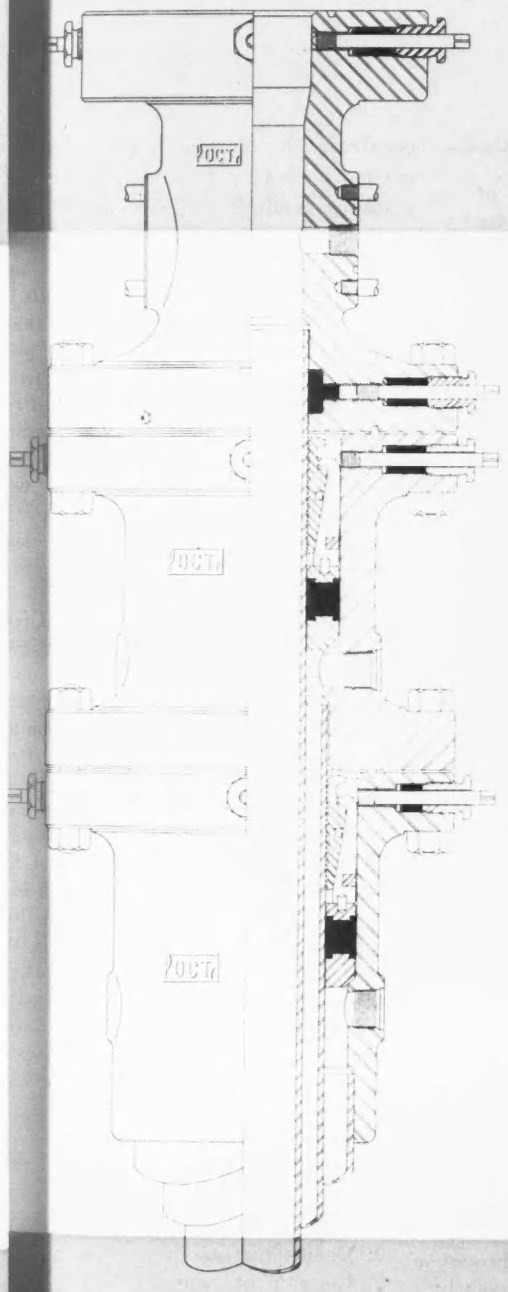
On your next deep well . . . on wells of any depth . . . take advantage of the added strength, safety, convenience and flexibility the O-C-T "C-19" provides. It's the only slip type head that meets every well completion condition with a single compact model.

Write Today

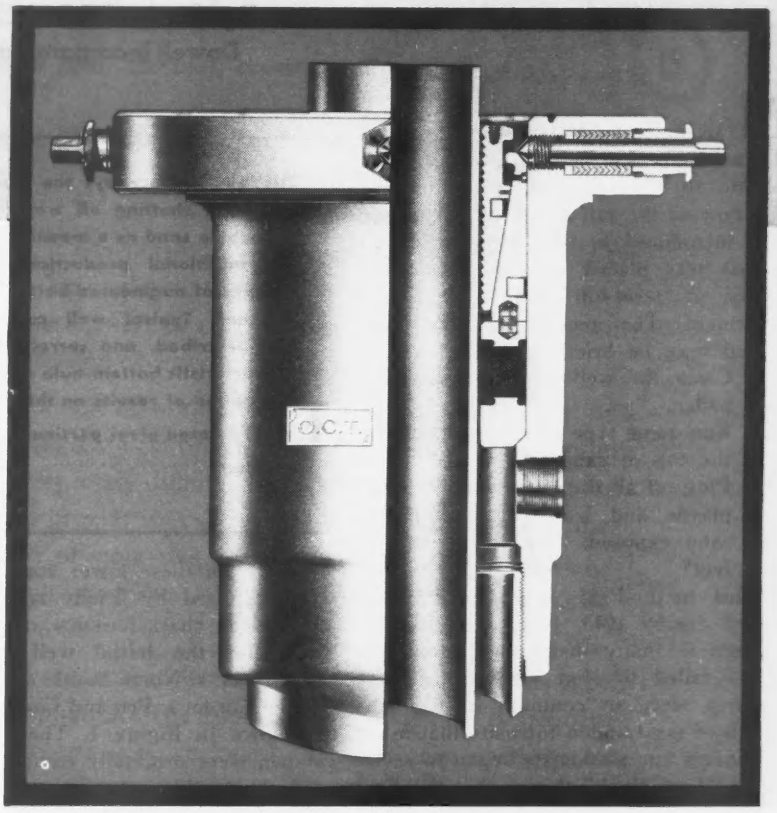
Send for your free copy now of this new O-C-T "C-19" booklet entitled "20,000' and then some." This 24-page book contains complete engineering specifications and details on the "C-19" with recommended wellhead assemblies for deep, high pressure wells.

NOW PROVED DEPENDABLE

AT 20,000' *and then some!*



With the O-C-T "C-19" Casing Head as the foundation, this O-C-T wellhead assembly is installed on The Superior Oil Company's world's deepest well. It supports 9,981' of 47 and 53½ lb. 9⅝" casing and 19,765' of 7" casing.



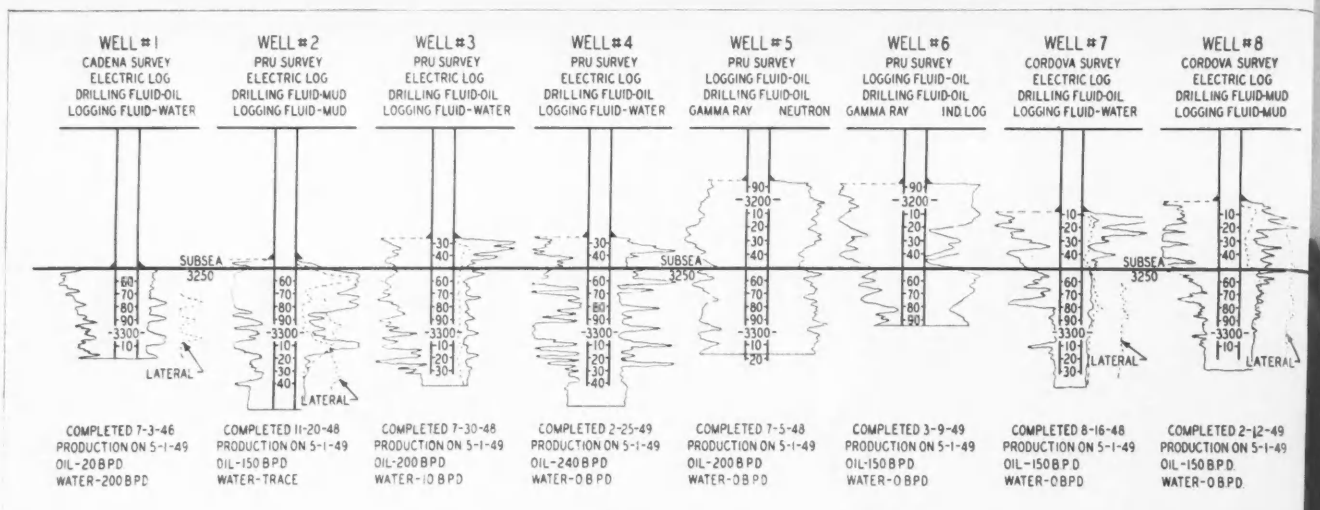
This model O-C-T "C-19" Casing Head was used on The Superior Oil Company's new world's record depth well. It is available in two models . . . C-19 with lock screws or C-19-C without lock screws.

ASSOCIATION OF WELL HEAD EQUIPMENT MANUFACTURERS CERTIFIED

Oil Center Tool Co.

P. O. Box 3091, Houston, Texas

Export Representatives: Venezuela, Colombia, Peru, and Ecuador—Berry & Hall, Apartado No. 304, Maracaibo, Venezuela—Sterling Areas—Le Grand, Sutcliff & Gell, Ltd., Southall, Middlesex, England. Address Export Inquiries for All Other Countries to P. O. Box 3091, Houston 1, Texas.



it is necessary to drill approximately 100 feet in order to explore all possible productive zones. Many methods are employed for this operation. They are, cable tools, rotary tools and drilling by reverse circulation. The method described as drilling by reverse circulation is the one most adapted for the deepening operation. The equipment includes drawworks and power mounted on a truck, reverse circulating rotary head, pump and steel slush tanks. This equipment is very mobile and requires not more than four hours to set up. The drill pipe used includes the production tubing string with 120 feet of 2-7/8 inch drill pipe on bottom. This size drill pipe with tool joints is recommended when working through 5½-inch casing, with 3½-inch drill pipe when working through 7-inch casing. The primary function of this drill pipe on bottom is to insure straight hole drilling below the casing shoe. The importance of straight hole drilling is quite apparent when 4½-inch outside diameter liners are successfully run in 4¾ and 4-7/8 inch holes. Drifting holes under the casing shoe necessitates an underreaming operation before a liner can be landed on bottom. The costs and hazards of underreaming a hole using tubing as drill pipe are well recognized. Experience has shown that it requires three times the rig time for underreaming a 4¾-inch hole to 6¼-inch as it does to cut the 4¾-inch hole. Not only is the operation costly, but it is extremely hazardous

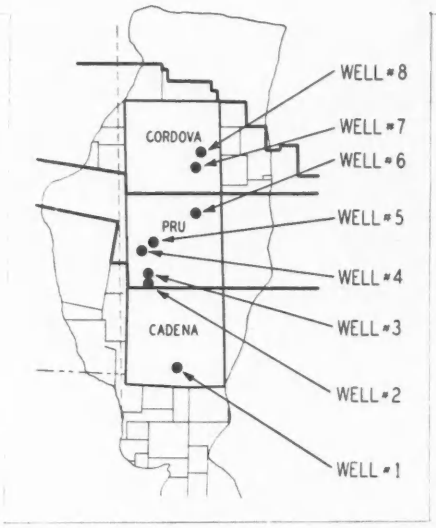


FIGURE 1. Map and cross-section of Cadena, Pru and Cordova surveys, Rusk County, Texas.

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7	Vargas	7″ —3700	3795	120′—5″ OD	....	150	1-14-46	Abandoned Dry Test	Ye
8	R. W. Smith	7″ —3608	3666	92′—5″ OD	6¼″	75	2-22-46	Abandoned Dry Test	Ye
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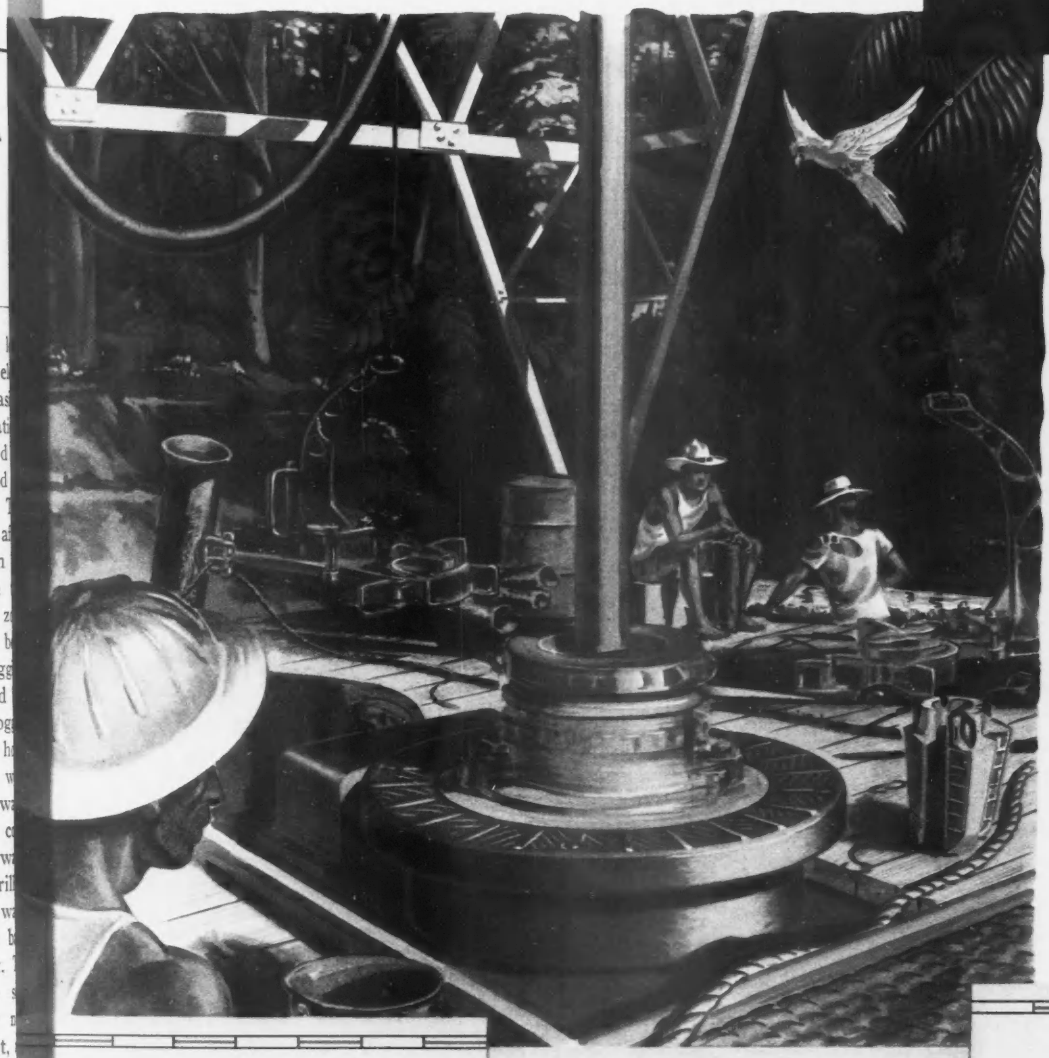
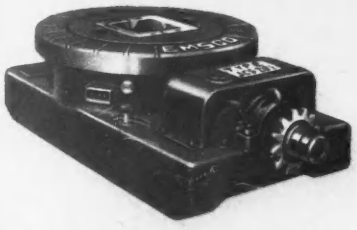
—Field Proven the World Over...

EMSCO RUGGED ROTARIES



Wherever drilling equipment is found . . . whenever efficiency and dependability are a must . . . you will find Emsco Rotary Machines. This world-wide acceptance is the result of more than a quarter century of specialized experience in the manufacture of rotary machines. Today, Emsco rotaries represent the most advanced engineering design for this type of equipment. The fabriform base provides greater strength, more rigidity and less weight. Ring gears and pinions are precision machined from alloy steel forgings. This assures quiet and efficient operation at all times. All gear teeth are flame hardened assuring maximum service life. These and many other design and construction features make Emsco rotaries the finest in the market. Ask your nearest Continental-Emsco representative for complete information.



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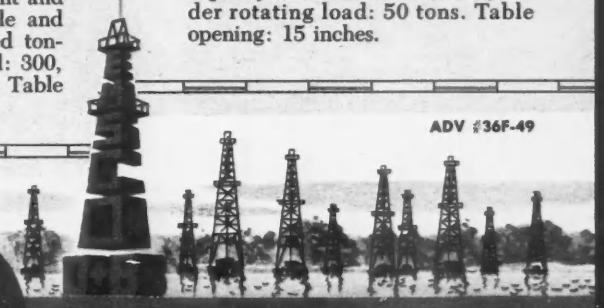

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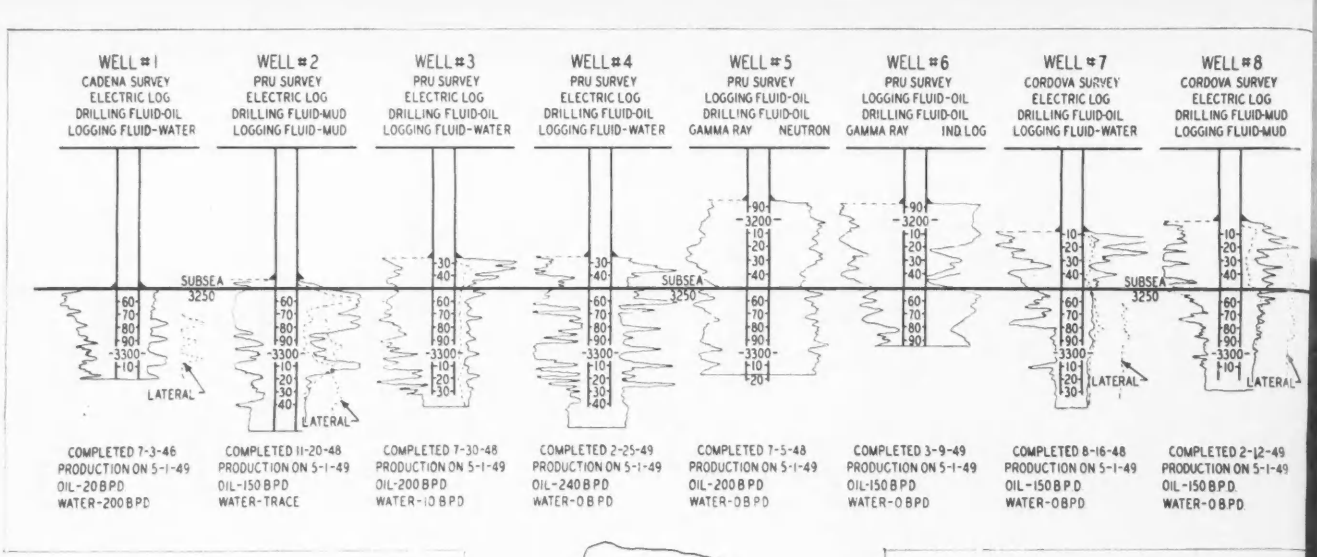

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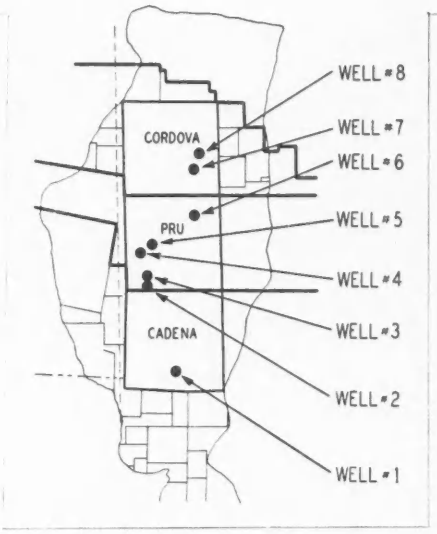

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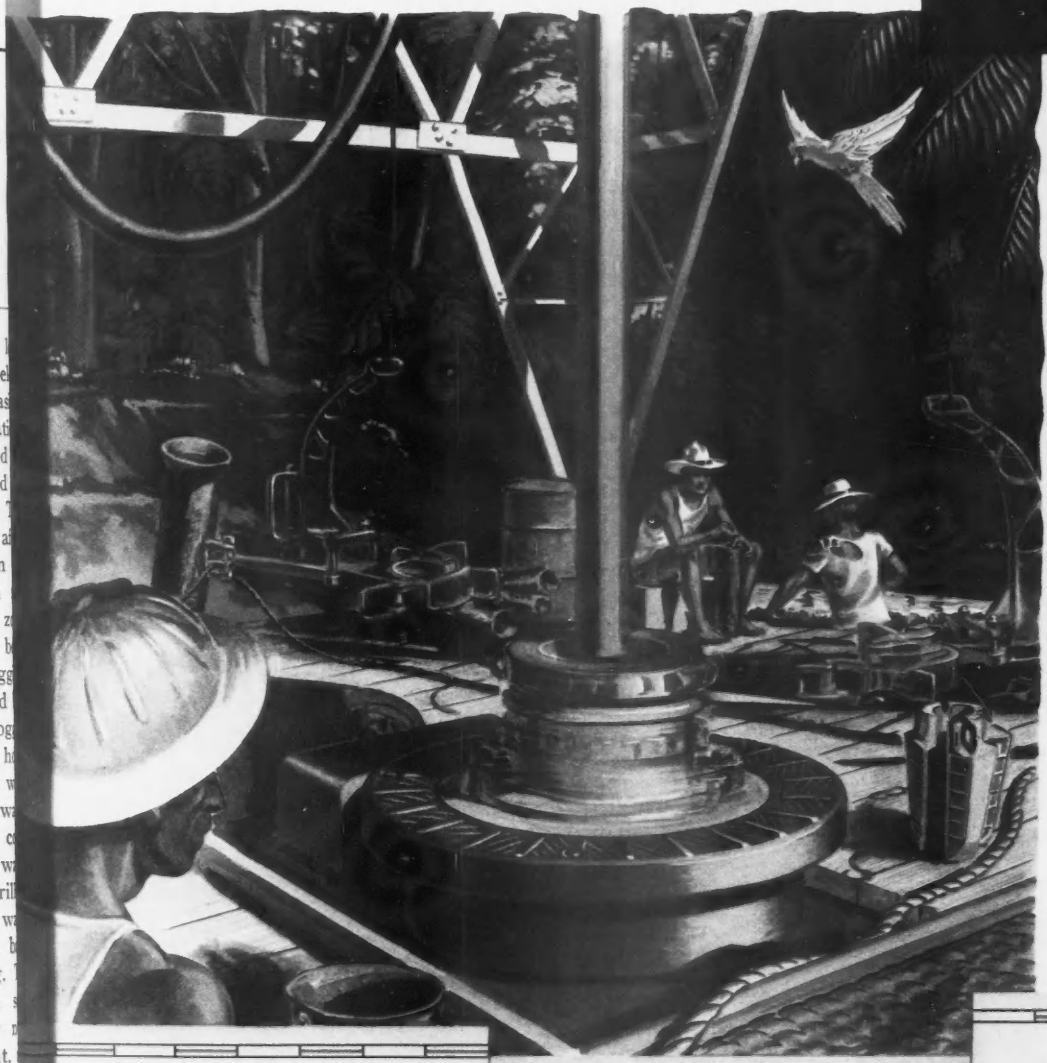

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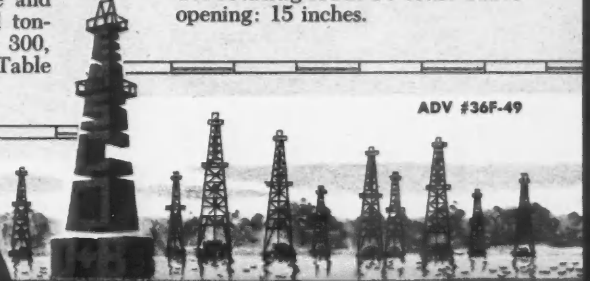
NS-15—A sturdy, lightweight Rotary Machine for shallow and medium-depth drilling. Rated tonnage capacity under dead load: 125, under rotating load: 50 tons. Table opening: 15 inches.

ADV #36F-49



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ADV. 36-B-49

ell No.	Survey	Casing Diameter Set	Total Depth	Liner Feet Set and Size	Hole Size	Gallons	Date Completed	1-1-49 Percent Oil—REMARKS	Completed Below Original Total Depth
11	Pru	7″ —3678	3792	174′—5½″ OD	6¼″	150	4- 2-46	75% Dry Test Intermediate Sd.	Yes
12	Pru	7″ —3661	3738	139′—5½″ OD	6¼″	140	4- 7-46	100% Dry Test	Yes
13	Pru	7″ —3607	3828	225′—5½″ & 4½″ OD	6¼″	225	4-18-46	100% Dry Test	Yes
14	Pru	5½″—3669	3784	180′—4½″ OD	9⅝″ & 4¾″	185	4-24-46	100% Dry Test	Yes
15	Vargas	5½″—3670	3808	176′—3½″ OD	4¾″	150	4-26-46	Abandoned Dry Test	Yes
16	Pru	5½″—3666	3784	180′—4½″ OD	7⅞″ & 5¼″	200	4-30-46	100% Dry Test	Yes
17	Pru	7″ —3672	3808	180′—5½″ OD	6¼″ & 9⅞″	200	5- 6-46	83% Dry Test Repair Top Liner (Bailer)	Yes
18	I. Ruddle	7″ —3594	3725	180′—5″ OD	6″ & 7″	175	5- 9-46	100% Dry Test	Yes
19	Pru	.....	3697	180′—5″ OD	6¼″	168	5-10-46	65% Dry Test Top Sd.	Yes
20	Pru	5½″—3654	3820	214′—4½″ OD	7¾″ & 5¼″	225	5-12-46	100% Dry Test	Yes
21	Cadena	7″ —3715	3778	127′—4½″ OD	6″ & 6½″	185	5-19-46	Abandoned Dry Test	Yes
22	Cadena	5″ —3660	3739	110′—4″ OD	6¼″	160	5-23-46	Abandoned Dry Test	Yes
23	Dainwood	7″ —3656	3677	64′—5″ OD	6¼″	125	5-23-46	Abandoned Dry Test	No
24	Caruthers	7″ —3545	3730	213′—5½″ OD	6¼″ & 9⅞″	250	5-31-46	Abandoned Dry Test	No
25	Pru	5½″—3665	3784	159′—4½″ OD	8″ & 5½″	185	5-31-46	100% Dry Test	Yes
26	I. Ruddle	6″ —3612	3740	195′—4½″ OD	9⅞″ & 5¼″	150	6- 5-46	78% Dry Test Top Sd.	No
27	Pru	5½″—3657	3778	178′—4½″ OD	5¼″ & 7⅞″	200	6- 6-46	100% Dry Test	Yes
28	Cordova	7″ —3686	3736	224′—5½″ OD	9⅞″ & 6¼″	180	6-18-46	100% Dry Test	Yes
29	Cadena	7″ —3603	3671	118′—4½″ OD	6¼″	175	6-27-46	Unsuccessful Plug fouled in seating nipple	Yes
30	Cadena	7″ —3603	3671	118′—4½″ OD	6¼″	175	6-29-46	30% Dry Test	Yes
31	R. W. Smith	7″ —3628	3735	200′—5″ OD	6¼″	160	7- 1-46	Abandoned Dry Test	No
32	Cordova	7″ —3694	3696	158′—4½″ OD	6¼″	150	7- 8-46	100% Dry Test	Yes
33	Cordova	7″ —3714	3802	181′—5″ OD	6¼″	160	8-25-46	100% Dry Test	Yes
34	Cordova	5½″—3687	3778	155′—4″ OD	.....	150	10- 4-46	100% Dry Test	Yes
35	Dance	7″ —3804	3904	156′—5″ OD	6¼″ & 9⅞″	215	10- 6-46	Abandoned Dry Test	No
36	Cordova	6⅝″—3685	3773	171′—5″ OD	6¼″ & 9⅞″	175	10-10-46	100% Dry Test	Yes
37	Cordova	.....	3788	196′—5½″ OD	6¼″	215	10-11-46	100% Top Liner Repaired	Yes
38	Cordova	7″ —3712	3826	180′—5″ OD	6¼″	175	10-14-46	63% Dry Test	Yes
39	Cordova	7″ —3743	3788	105′—5½″ OD	6¼″	125	12- 7-46	100% Dry Test	Yes
40	Cordova	7″ —3712	3790	89′—4⅞″ OD 81′—5½″ OD	6½″	225	10-10-46	Plastic liner unsuccessful	Yes
41	State Land	7″ —3514	3556	73′—5″ OD	5½″	75	12-19-46	50% Dry Test Top Sd.	No
42	Cordova	4½″—3636	3804	.....	.....	135	12-23-46	100% Dry Test	Yes
43	Cordova	7″ —3681	3760	152′—5″ OD	6¼″	140	1- 5-47	56% Dry Test	Yes
44	Cordova	6⅝″—3716	3810	178′—5″ OD	9⅞″ & 5⅞″	260	1- 8-47	100% Dry Test	Yes
45	Cordova	5½″—3675	3800	176′—4″ OD	4¾″ & 7⅞″	170	1-31-47	100% (3 bbls/day) Dry Test Abandoned	Yes
46	Cordova	7″ —3603	3777	163′—5″ OD	6¼″	150	2-20-47	100% Dry Test	Yes
47	Cordova	5½″—3750	3835	140′—4″ OD	4¾″	150	2- 5-47	Abandoned (Top liner Repaired Bailer))	Yes
48	Cordova	4½″—3684	3791	162′—3½″ OD	3⅞″	100	3- 1-47	66% Dry Test	Yes
49	Wynne	7″ —3613	3713	150′—5½″ OD	6¼″	200	5-17-47	100% Dry Test Top Sd.	No
50	Pru	6⅝″—3629	3715	150′—5″ OD	5¾″	140	5-22-47	100% Dry Test	Yes
51	Pru	7″ —3672	3775	180′—5″ OD	6¼″	160	5-24-47	100% Dry Test	Yes
52	Shaw	7″ —3690	3792	121′—5½″ OD	6¼″ & 9⅞″	155	5-27-47	Abandoned Dry Test	Yes
53	Cordova	7″ —3690	3764	149′—5″ OD	6¼″	140	5-28-47	100% Dry Test	Yes
54	Cordova	5½″—3656	3711	130′—4½″ OD	8″	160	5-30-47	82% Dry Test	Yes
55	Shaw	5½″—3789	3821	101′—4½″ OD	4¾″	75	7-30-47	Abandoned Dry Test	Yes
56	Cordova	7″ —3695	3832	176′—5″ OD	6¼″	175	8- 8-47	78% Dry Test	Yes
57	Pru	7″ —3650	3759	192′—5½″ OD	6¼″	160	8-15-47	100% Dry Test	Yes
58	Pru	7″ —3622	3741	181′—5″ OD	6¼″ & 9″	195	8-16-47	7% Dry Test	Yes
59	Cordova	6⅝″—3690	3766	155′—5″ OD	5¾″ & 10″	200	8-21-47	100% Dry Test	Yes
60	Cordova	7″ —3675	3776	161′—5″ OD	6¼″ & 8″	140	8-24-47	100% Dry Test	Yes
61	Cordova	7″ —3742	3846	185′—5″ OD	6¼″	170	8-29-47	69% Repaired with Bailer Liner leaked at bottom	Yes
62	Christian	5½″—3640	3740	131′—4½″ OD	5½″	100	9-25-47	75% (Dry Test)	Yes
63	Pru	5½″—3674	2797	166′—4½″ OD	9⅞″ & 5½″	255	10-27-47	100% Dry Test	Yes
64	Pru	7″ —....	3792	198′—5″ OD	6½″ & 7″	200	10-31-47	100% Dry Test	Yes
65	R. W. Smith	7″ —3646	3720	127′—5″ OD	6¼″	130	11- 7-47	Abandoned Dry Test	No
66	Pru	7″ —3712	3790	170′—5″ OD	6¼″	225	12-10-47	20% Dry Test	Yes
67	Cadena	7″ —3606	3651	138′—4½″ OD	6¼″	170	1-18-48	Abandoned Dry Test	Yes
68	Pru	6⅝″—3645	3746	155′—5″ OD	5¾″	125	3-18-48	29% Dry Test	Yes
69	Cadena	5½″—3583	3697	187′—4½″ & 4″ OD	5½″ & 5″	155	4-20-48	100% Dry Test	Yes
70	John Blair	7″ —3618	3683	135′—5″ OD	6¼″	140	4-30-48	10% (Top Liner repaired—Bailer)	No
71	Cordova	7″ —3690	3785	175′—5″ OD	6¼″	150	5- 4-48	Abandoned Dry Test	No
72	Pru	7″ —3599	3728	181′—5″ OD	9⅞″ & 6¾″	200	5-23-48	100% Dry Test	Yes
73	Cordova	4½″—3740	3854	188′—3½″ OD	7″ & 3⅞″	100	6- 4-48	26% Dry Test	Yes
74	Pru	7″ —3640	3735	165′—5″ OD	6¼″	155	6-16-48	80% Dry Te t	Yes
75	Pru	7″ —3592	3726	217′—5″ OD	9⅞″ & 6¼″	200	6-24-48	100% Dry Test	Yes
76	Pru	7″ —3603	3728	180′—5″ OD	6⅛″	175	6-25-48	25% Dry Test Intermdeiate Sd.	Yes
77	Pru	7″ —3585	3700	174′—5″ OD	6¼″	200	7-10-48	95% Dry Test (10 bbls/day)	Yes
78	Pru	7″ —3618	3724	160′—5″ OD	6¼″	175	7-24-48	95% Dry Test	Yes
79	Pru	7″ —3607	3717	174′—5″ OD	6⅛″ & 9½″	200	8-13-48	100% Dry Test	Yes
80	Cordova	7″ —3748	3872	187′—5″ OD	6¼″	175	8-20-48	100% Dry Test	Yes
81	Pru	7″ —3628	3630	154′—5″ OD	9⅝″ & 6¼″	225	9- 6-48	100% Dry Test	Yes
82	Pru	5½″—3593	3704	175′—4½″ OD	4¾″	150	9-13-48	95% Dry Test (10 bbls/day)	Yes
83	Cadena	5½″—3580	3660	135′—4″ OD	10″ & 7⅝″	275	10- 4-48	15% Dry Test Top Sd.	No
84	Cordova	5½″—3700	3855	180′—4″ OD	4¾″ & 9⅞″	175	10-15-48	100% Dry Test	Yes
85	Cordova	7″ —3751	3840	150′—5″ OD	6¼″	175	12-24-48	100% Dry Test	Yes
86	Pru	7″ —3643	3721	148′—5″ OD	9⅞″ & 6¼″	225	10-26-48	90% Dry Test (10 bbls./day)	Yes
87	Pru	7″ —3616	3721	163′—4″ OD	6¼″ & 5½″	200	11- 9-48	100% Dry Test	Yes
88	R. L. Penny	7″ —3674	3823	185′—5″ OD	6¼″	200	11-14-48	100% Dry Test	Yes
89	Pru	6⅝″—3644	3780	208′—5″ OD	5¾″	125	11-14-48	100% Dry Test	Yes
90	Pru	5½″—3609	3720	142′—4″ OD	4¾″	140	12- 6-48	100% Dry Test	Yes
91	Pru	5½″—3798	3833	114′—4″ OD	4¾″	100	12-29-48	100% Dry Test	Yes
92	Pru	7″ —3645	3701	152′—5″ OD	6¼″	180	12-31-48	100% Dry Test	Yes
								5-1-49 Percent Oil—	
93	Pru	7″ —3695	3710	.....	....	180	1-16-49	100% Dry Test	Yes
94	Codina	5½″—3604	3700	187′—4½″ OD	4½″	130	1-28-49	100% Dry Test	Yes
95	Cordova	5½″—3688	3793	145′—4½″ OD	4¾″	150	2-10-49	100% Dry Test	Yes
96	Pru	5½″—3618	3691	145′—4″ OD	4¾″	130	2-15-49	100% Dry Test	Yes
97	Pru	7″ —3587	3687	168′—5″ OD	6¼″ & 9⅞″	200	2-22-49	50% Dry Test	Yes
98	Cordova	7½″—3750	3826	168′—4″ OD	4⅞″ & 6¼″	140	2-22-49	100% Dry Test	Yes
99	Pru	6⅝″—3670	3771	182′—5″ OD	5¾″ & 9″	120	3- 2-49	100% Dry Test	Yes
100	Pru	7″ —3590	3694	157′—4″ OD	4¾″ & 6¼″	160	3- 4-49	30% Dry Test	Yes
101	Cordova	7″ —3813	3716	179′—5″ OD	6¼″ & 10″	180	3- 5-49	0% Dry Test	Yes
102	Cordova	5½″—3688	3642	122′—4½″ OD	4⅜″ & 5½″	100	3- 7-49	0% Dry Test	No
103	Pru	7″ —3592	3690	176′—5″ OD	6¼″	150	3- 9-49	5% Dry Test	Yes
104	Witcher	7″ —3571	....	120′—5½″ OD	6¼″	100	3-17-49	95% Unsuccessful re-set Liner	No
105	Pru	5½″—3615	3694	152′—4″ OD	4¾″ & 5½″	130	3-29-49	100% Dry Test	Yes
106	Pru	6⅝″—3633	3636	193′—5″ OD	10″ & 5¾″	200	4- 2-49	100% Dry Test	Yes
107	Pru	7″ —3611	3615	167′—5″ OD	5⅛″ & 6¼″	250	4- 5-49	Dry Test	Yes
108	Pru	6⅝″—3626	3638	194′—5″ OD	5¾″ & 9⅛″	150	4- 9-49	0% Dry Test	Yes
109	A. Caimack	5½″—3661	3722	125′—4″ OD	4¾″	100	4-14-49	5% Dry Test	No
110	Pru	7″ —3662	3674	180′—5″ OD	6¼″	175	4-16-49	100% Dry Test	Yes
111	Pru	7″ —3623	3704	152′—5″ OD	6¼″ & 9⅞″	200	4-18-49	Dry Test	Yes
112	Pru	7″ —3610	3713	151′—5″ OD	6¼″ & 9¾″	200	4-20-49	Dry Test	Yes
113	Pru	7″ —3630	3690	130′—5″ OD	6¼″	125	4-24-49	30% Dry Test	Yes

proceeded with mud. The fresh water invasion will be noted in the highly permeable conglomerate section near the top of the sand. There is a very good indication of a productive section from —3290 to —3315. Well 8 was drilled with an eight cc water-loss mud to insure as near as possible ideal conditions for electric logging. The long normal curve indicates higher resistant sand bodies below a subsea depth of —3245; however, the evidence of an oil producing zone being present is certainly not conclusive. The difficulty of locating the possible productive zones entirely by means of modern well logging is quite evident. The various logs and logging procedures described above have certain advantages; however, it is estimated that 80 per cent of all recommendations for final completions are based on cuttings, drilling time and the correlation of surrounding stratigraphy. It is, therefore, extremely important to obtain all possible geological data before formulating recommendations for final completion.

Setting of Blank Liner

The difficulty of setting short strings of pipe or liners for the purpose of isolating productive oil zones from zones carrying undesirable fluids has long been recognized by the oil industry. There have been many tools and techniques developed for the use of cement to achieve the desired results; however, there has been very little consistent data secured to definitely show why cement succeeds or fails as a plugging agent. Plastic was introduced for the purpose of setting a blank liner on January 2, 1944. Since that time there have been 113 applications in the East Texas Field. Of the 113 jobs shown in Table 1, 102 were initially successful, two were pulled and re-set successfully, seven failed at the top of the liner and one failed at the bottom. To date there has been no evidence of a failure due to channeling behind the liner. The data secured from these 113 jobs indicate definitely that a successful application of plastic is almost entirely dependent upon experienced personnel and the calculated volume of plastic required for the operation. The technique employed for the setting of a blank liner with plastic can best be illustrated by first describing the tools and materials which are shown in Figure 2.

Duplex Set Shoe and Choke Adapter: This tool is constructed from a drillable material which is adapted to any size liner with left-hand square threads adapted to the tubing string. The tapered choke assembly inside the tool allows the passage of rubber plugs at a surface pressure of 300 psi.

First Rubber Plug: This plug accomplishes the simple function of confining the plastic as it is pumped down the tubing.

Second Rubber Plug with Ball Attached: This accomplishes a dual function. It confines the plastic during pumping and acts as a back pressure valve when pumped through the choke assembly in the liner shoe.

Calcium Chloride Solution: This solution acts as a buoyant medium for the excess plastic which is pumped around the top of the liner as shown in Part C, Figure 2.

Filler plastic or controlled penetrating plastic has a specific gravity of 1.2 and a viscosity at 60° F. comparable to SAE 40 motor oil. This viscosity is reduced greatly to become a relatively thin liquid at 145° F. which is the bottom hole temperature encountered in the East Texas field. The flow into a permeable medium is controlled by adding special graded solids to the plastic. Field results have shown that one gallon per linear foot of sand exposed is a close approximation of the volume necessary for penetration. It has also been observed that the penetrating volume is nearly independent of the permeabili of the sands exposed and of differen pressure placed across the sand. Fil plastic is immiscible in water, oil a brine solutions. This property allo gravitational separation to occur wi fluids of different densities. It is b lieved the immiscible properties and relatively low viscosity of plastic a primarily responsible for the 113 jo without channeling indications behi liners. Both compressive and tens strengths are somewhat greater th neat cement.

Experimental data indicates plas has high bonding properties to poro media and smooth surfaces. It has be found that pressures in excess of 45 psi are necessary to shear a plug fro a 1 x 4-inch nipple. Being an inert, no permeable solid with high bonding pro erties renders plastic a very useful t for the permanent segregation of zon behind liners. The change in physic properties from a liquid to an ine solid is entirely dependent upon chem cal reactions. The time required for th change to be completed is controlled b the addition of catalytic agents. A se ting time of eight to ten hours is re ommended for the setting of a bla liner. This insures sufficient time to co rect for the occasional structural an mechanical failures that seem to be i herent to all oilfield practices. Figure illustrates the procedure followed i the plastic placement operation. Part shows the relative position of all t necessary tools as the filler plastic being pumped down the tubing strin The displacement rate is reduced to t gallons per minute as shown under Pa B. This rate is maintained with inte mittent shutdowns until the plastic bled to the top of the liner. These slo displacement rates with intermitte shutdowns are recommended in ord to allow gravitational separation to o

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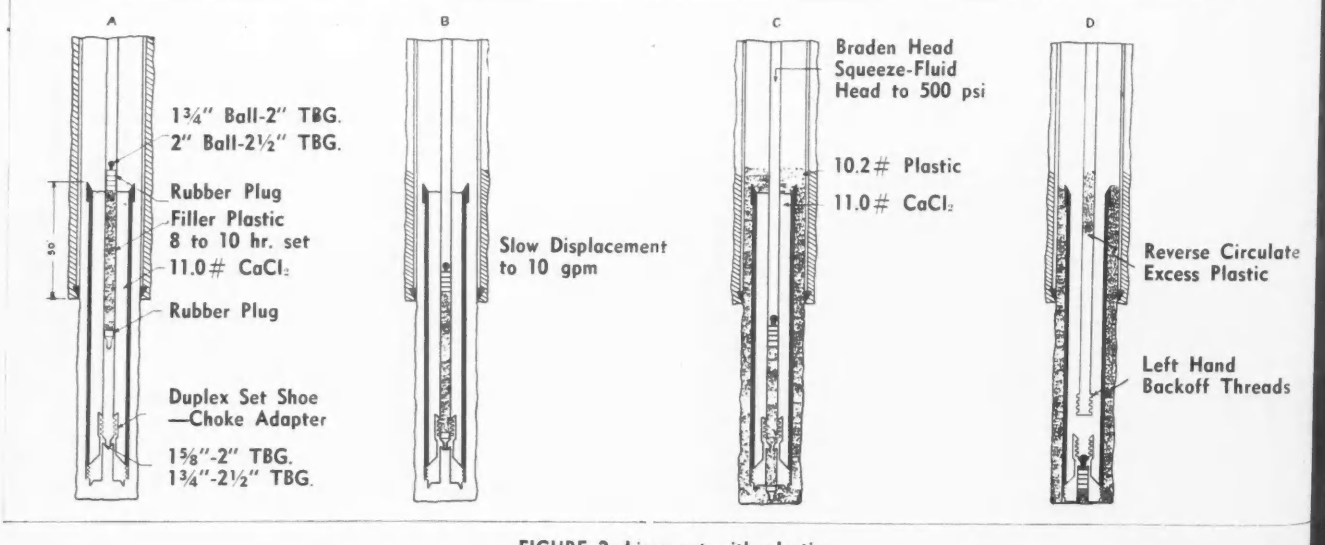

FIGURE 2. Liner set with plastic.

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FORMATION AND CASING TESTING

JOHNSTON

A Study of the Effect of NaCMC on Bentonite

By BAHNGRELL W. BROWN
Chemist, Natural Resources Institute

THE commercial production in volume of sodium carboxymethyl cellulose, has opened the way for reappraisal of this important chemical in its application to oil well drilling. At the time of Kaveler's early (1946) researches[1] it was difficult to obtain alkali metal CMC salts in standard commercial quantities. This picture has changed with the introduction of technical and refined grades of sodium carboxymethyl cellulose, available in carload lots at prices ranging from 28 to 66 cents per pound.

The researches of Kaveler, have shown that the addition of an alkali metal sodium carboxymethyl cellulose to the conventional aqueous drilling mud will effect a substantial improvement in all desirable characteristics. In the course of his work with actual field muds, he noted that the resulting viscosity gained by use of this (CMC) additive "depends somewhat upon the quantity of bentonites and non-bentonitic type clays present."

The observations of Kaveler are in thorough agreement with our findings, and we have also noted that whereas sodium CMC has itself considerable viscosity in aqueous solution, it nevertheless imparts viscosity and gel strength to certain clays far out of proportion to the inherent physical properties of the chemical additive. As an example:

It was found that 0.3 grams of reagent in 376 cc of water gave a Stormer viscosity equivalent to ten grams. Twenty-four grams of a mixture of a commercial bentonite when dispersed in an equal volume of water gave a viscosity equivalent to 115 grams. Twenty-four grams of a mixture of bentonite with 0.3 grams of CMC reagent when similarly dispersed gave a Stormer viscosity equivalent to 250 grams. If the viscosity had been an additive function of the viscosity of the reagent, then the maximum obtainable viscosity would have been about 115 plus 10, or 125 grams; whereas, actually, the measured value was twice as much as could be expected. The aqueous viscosities of CMC in the concentrations as used in our test work are relatively small. Figure 1 (after the du Pont Service Bulletin) shows the general relation between the percentages of aqueous concentration of various grades of CMC and their viscosities.

Test Varying Proportions

Tests were undertaken using varying proportions of sodium carboxymethyl cellulose. The grade 4WXH extra high viscosity NaCMC was used in all tests. This reagent is a non-hygroscopic, dry powder, which imparts a viscosity of from 500 to 1500 cps. to a 1 percent aqueous solution. The high decomposition temperature (180° C) of this material allows it to be mixed with the clay to be tested before the usual oven drying procedure at 105° to 110° C. Weighed portions of dried ground clay were mixed with the appropriate weights of CMC by tumbling for one hour. Each mixture and the original clay as control were tested according to standard bentonite test methods.[2] Table 1 shows the results obtained with various mixtures of CMC and a high-grade commercial bentonite taken at a drilling well. The recorded values are for a 6 percent aqueous solution.

Two Black Hills bentonites of inte
mediate properties were next studie
with the results reported in Table
These data are also for a 6 percent aqu
ous solution. In each instance shown
Tables 1 and 2 the viscosity was bu
up at a far faster rate than could
accounted for by the additive viscosi
of the aqueous CMC in those conce
trations used. The difference in the fun
tioning of ten-minute gel strength in t
two series was noted as well as the i

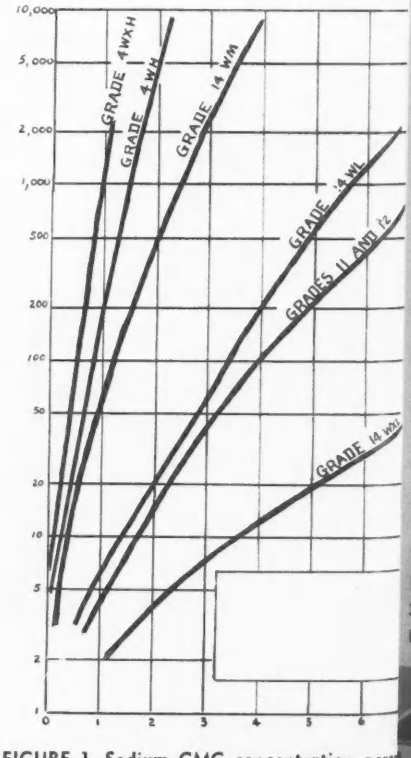

FIGURE 1. Sodium CMC concentration perce
weight.

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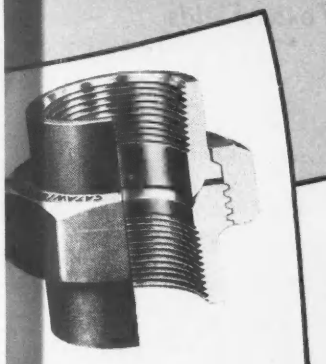
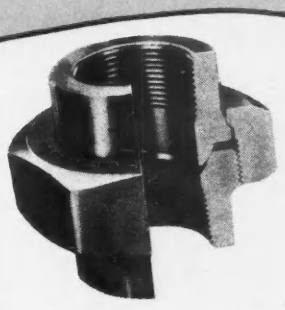


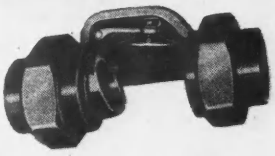
CATAWISSA NO. S-1A

The hot-forged steel union with heavy, coarse ACME threads in the union nut for quick make-up or disconnecting in the field.



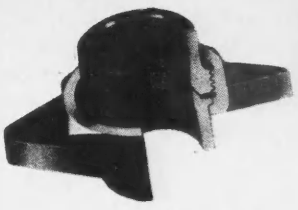
CATAWISSA NO. S-1

Hot-forged steel unions with U. S. Standard V-Threads in the union nut are recommended for general oil-field service.



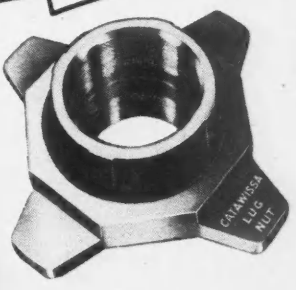
CATAWISSA NO. 502 CHECK VALVE

Accessible, efficient, economical, Catawissa Double Union Swing Check Valves are full opening and are furnished with union connections on both ends, eliminating the union and nipple necessary to install the regular type check valve. They are the flow-line type designed for use where no stop is installed close to the check valve.



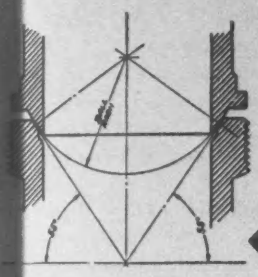
CATAWISSA NO. L-1A

This union is furnished with a 2-lug nut which can be applied with either a hammer or wrench. The triangular shape eliminates distortion or breaking. Designed with coarse ACME threads for general service on drilling rigs and all piping purposes where quick make-up is desirable. Available in standard and double extra heavy weight. Sizes 1" to 3" inclusive.



CATAWISSA NO. L 1-4A

Made in 4-inch size with four lugs on the nut.



BALL-TO-ANGLE SEAT

"OILWELL" store and warehouse points are stocked with a complete line of Catawissa forged-steel unions and check valves. These Catawissa products are designed and recommended for the rough-and-ready demands of any oil country application.

NOTE THESE IMPORTANT FEATURES

HOT-FORGED . . . from solid, rectangular steel bars, Catawissa Unions are free from sand and blow holes. They will expand and contract with the pipe, assuring tight joints.

THREADS . . . Catawissa Unions and Valves are supplied with either FULL ACME Threads or U. S. Standard V-Threads in the union nuts and on the female end.

SEATS . . . in all Catawissa Unions are a 55° angle on the female end to a Ball on the male end, assuring a perfect seal even when the pipe is not perfectly aligned. Carefully hand-ground seats which require no packing are inspected and tested under water to assure holding qualities.

Contact your nearest "Oilwell" representative to assist you with all your oil-field problems

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UNITED STATES STEEL

proved wall building characteristics indicated in series B of Table 2.

Another series of tests was run using this time a sub-bentonite clay from Northern Wyoming and another from Rock River. Results are reported in Table 3.

On the basis of these tests and previous work, it was seen that the response of a given clay to CMC reagent is in the largest part a function of the clay itself, and the clay structure was imagined to be opening, lotus fashion, under the peptizing influence of the sodium CMC additive. To further explore this thought, a Fuller's earth type clay from Texas was run in a CMC series with the negative results reported in Table 4.

Conclusions

This exploratory work in the action of sodium CMC on the various type clays of the bentonite and sub-bentonite families has conclusively shown that the response of the individual clay to this additive reagent is in, by far the greatest part, a function of the clay itself, and that the physical response is, in instances of the bentonitic type clays, far out of proportion to the physical intensities of the additive alone in equivalent aqueous solutions.

It is doubtful if the presence of calcium in the clays has much effect on the reaction since it has been shown by Kaveler that di-valent ions do not precipitate CMC; therefore, if it can be demonstrated that naturally occurring free and adsorbed saline ions in the clay do not appreciably influence the action of CMC, then this reagent should prove a valuable research tool in the study of individual clay types where it is desired to investigate the relation of molecular structure to physical properties.

REFERENCES

[1] H. H. Kaveler, Oil and Gas Journal 45, No. 9 (1946) 81-9.

[2] H. G. Fisk, Natural Resources Research Institute Bulletin No. 2, University of Wyoming, Laramie, Wyo.

TABLE 1

SAMPLE	CLAY MIX USED		STORMER VISCOSITY		GEL STRENGTH		30 MIN. WALL BLDG.	
	% Clay	% CMC	Grams	Cps.	Initial	10-Min.	Water Loss	Filter Cake
1	100.00	0.00	115	15.5	24	160	....	....
2	99.95	0.05	125	19.0	25	155	....	....
3	99.80	0.20	145	25.5	75	160	....	....
4	99.40	0.60	190	40.0	95	160	....	....
5	99.80	1.20	250	60.0	120	165	....	....

TABLE 2

SAMPLE	CLAY MIX USED		STORMER VISCOSITY		GEL STRENGTH		30 MIN. WALL BLDG.	
	% Clay	% CMC	Grams	Cps.	Initial	10-Min.	Water Loss	Filter Cake
BH-1	100.00	0.00	75	5	24	40	....	.....
BH-2	99.95	0.05	75	5	29	75	....	.....
BH-3	99.90	0.10	84	7.4	33	85	....	.....
B-1	100.00	0.00	53	1.9	21	47	18 cc.	3/32″
B-2	99.99	0.01	65	3.2	29	50	....	.....
B-3	99.95	0.05	80	6.2	30	70	....	.....
B-4	99.90	0.10	93	8.0	30	90	15 cc.	3/32″
B-5	99.50	0.50	95	9.0	20	130	....	.....
B-6	99.10	0.90	109	13.0	25	175	13 cc.	2/32″

TABLE 3

SAMPLE	CLAY MIX USED		STORMER VISCOSITY		GEL STRENGTH		30 MIN. WALL BLDG.	
	% Clay	% CMC	Grams	Cps.	Initial	10-Min.	Water Loss	Filter Cake
G-1	100.00	0.00	16	....	3	4	21 cc.	4/32″
G-2	99.50	0.50	35	....	6	12	16 cc.	2/32″
R-1	100.00	0.00	15	....	5	7	19 cc.	3/32″
R-2	99.95	0.05	15	....	5	7	18 cc.	3/32″
R-3	99.90	0.10	15	....	5	8	17 cc.	3/32″
R-4	99.50	0.50	27	....	5	10	15 cc.	3/32″
R-5	99.20	0.80	35	....	7	14	14 cc.	2/32″
R-6	98.90	1.10	54	....	6	20	13 cc.	2/32″

TABLE 4

SAMPLE	CLAY MIX USED		STORMER VISCOSITY		GEL STRENGTH		30 MIN. WALL BLDG.	
	% Clay	% CMC	Grams	Cps.	Initial	10-Min.	Water Loss	Filter Cake
X-1	100.00	0.00	9	....	4	X	65 cc.	6/32″
X-2	99.50	0.50	9	....	4	X	65 cc.	12/32″
X-3	99.20	0.80	9	....	4	X	65 cc.	8/32″

Complete Deflocculation after 10 minutes.

Top Water Control with Plastic In East Texas Fields

■ CONTINUED FROM PAGE 12

cur near the plastic-annulus fluid contact. Part C illustrates the plastic squeeze operation. As the predetermined volume for penetration is pumped out below the shoe, a back pressure of 50 psi is maintained on the casing. This pressure is maintained until the plug with the ball attached is seated in the shoe. The fluid is then released on the casing to insure the secure seating of the ball and the rubber plug. The fluid is then slowly released from the tubing. At this point the tubing is lowered and rotated to the right to disengage the liner. Circulation is attempted down the tubing to check the releasing operation. If circulation is established, the excess plastic is reversed from the well as shown under Part D. Dry testing or selective perforating operations may proceed sixteen hours after the plastic has been placed behind the liner.

It has been common practice to pump or swab a well dry before perforating the desired section. This insures a definite shutoff at the top and bottom before the productive interval is opened for final completion. There are two methods employed for the re-opening of isolated zones behind liners. They are the conventional gun perforating that fires a bullet through the casing and the shaped charge or "jet" perforating that projects a high velocity gas through the casing. There has been only one apparent perforating failure among the 113 liners set with plastic. This occurred in a four-inch OD liner set in a 4¾-inch hole. The conventional method failed to obtain penetration in a section that was later reopened by "jet" perforating. Maximum penetration, however, is not the most important function of the perforating procedure. Measurements are definitely the most important. The technique of locating collars in the oil string is a well-established method of correlating shooting and logging depths. This technique or one similar must be incorporated in the final completion operation before a maximum recovery can be expected from the thin oil zones found in the lower part of the Woodbine sand.

The development program for the completion of wells in lower sections is gradually gaining momentum. It has been relatively slow in the past, primarily because of the bonus allowed for the production of salt water in the East Texas Field and the cost of the entire remedial operation. It is believed that the remedial operation as described in the foregoing report will be necessary in many areas before a maximum ultimate recovery can be attained from the East Texas field.

Baash-Ross News

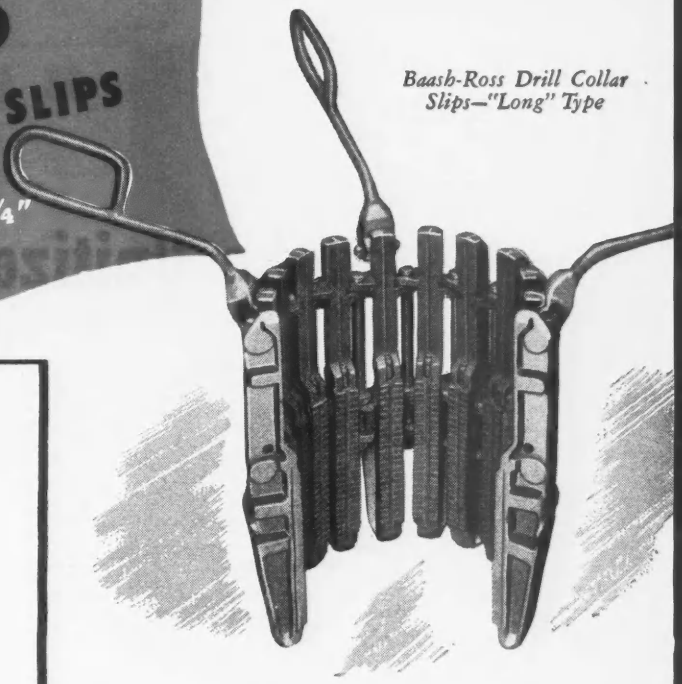
BAASH-ROSS TOOL COMPANY · LOS ANGELES · HOUSTON · NEW YORK

OUR 29th YEAR

4 HAZARDS

MAKE BAASH-ROSS DRILL COLLAR SLIPS "MUST" SAFETY PROTECTION

. . . And Every Drill Collar from 3" to 8¼" can have this vital protection!



Baash-Ross Drill Collar Slips—"Long" Type

FOUR HAZARDS make supporting a drill collar in the rotary table one of the riskiest of all rig operations . . .

1. *The constant change of drill collar diameter caused by wear and abrasion against the fresh-cut walls of the hole.*
2. *The usual flush design with no shoulders for stopping a slipping drill collar.*
3. *The drill collar's hard heat-treated surface that reduces gripping efficiency.*
4. *The relatively low drill string weight available for wedging the slips into the bowl.*

That's why safety-minded operators throughout the world have adopted Baash-Ross Drill Collar Slips as "must have" rig equipment, because these Slips are *specially designed* to overcome the risks of supporting a drill string in the rotary table. In contrast to the normal fixed-curvature design of rotary slips, the unique multi-segment design of Baash-Ross Drill Collar Slips permits them to w-r-a-p around the drill collar like a chain tong. They take a full slip-proof grip whether the drill collar is new or worn, round or out-of-round. *And they automatically compensate for as much as 1½" change in drill collar diameter — more than ample for modern drilling operations.*

For example, note in the table how a Baash-Ross Drill Collar Slip that fits a 7" diameter drill collar will also fit *any* diameter down to 5½". Adjustment for wear is automatic and continuous throughout the working range!

This means that Baash-Ross Drill Collar Slips automatically take a *full* grip on any drill collar within their range—a grip that gives adequate support to compensate for the continuous wear which changes drill collar diameters . . . for the hard heat-treated surface . . . and for the lack of drill string weight.

Sizes and Operating Ranges of Baash-Ross Drill Collar Slips

Size*	Operating Range From	Operating Range To
A	3"	4½"
B	3¾"	5¼"
C	4¼"	5¾"
D	5½"	7"
E	6¾"	8¼"

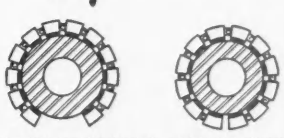
*(all sizes available in both "Regular" and "Long" types)

TWO TYPES

Baash-Ross Drill Collar Slips are available in two types —"Regular" and "Long." The "Long" type has extensions above the gripping area to provide a seat for the Baash-Ross Safety Clamp — the clamp that puts a non-slip, *yet removable,* "stop shoulder" on *any* drill collar to compensate for the hazards of flush design when supporting the collar in the table. For complete details see your nearest Baash-Ross representative — or write direct!

The "Why" of Baash-Ross Drill Collar Slips

ORDINARY SLIPS that fit the drill collar when new (A) are unable to adjust themselves to smaller diameters as the drill collar wears away. Soon, grip becomes less and less adequate (B) and risk of a costly fishing job constantly greater.



BAASH-ROSS DRILL COLLAR SLIPS consist of many narrow slip segments flexibly linked together. Result —they w-r-a-p around the drill collar and always take the same *full* grip whether drill collar is new or worn, round or out-of-round.

LINERS ARE EASILY RENEWED

To insure long life, minimum maintenance and maximum gripping efficiency at all times, the liners in Baash-Ross Drill Collar Slips can be readily renewed by simply pulling a stainless steel pin, sliding out the worn liner, inserting a new liner and replacing the pin. *It's simple, quick and inexpensive!*

How to do it!

DRILLING HINTS

$10 is paid for each illustrated acceptable contribution. Mail to The Editor, WORLD OIL, P. O. Box 2608, Houston 1, Texas

HOW TO—Make Unitized Floor for Portable Rig

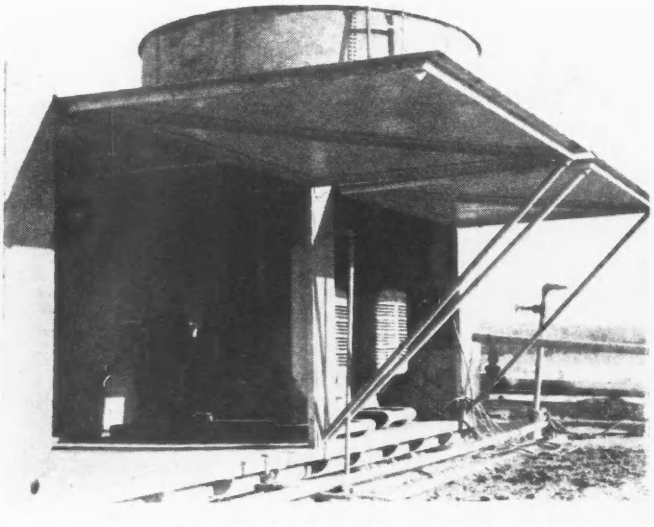
With the advent of portable rigs, it has become a practice to unitize the derrick, drawworks, mud pumps, etc., for easy rigging up, tearing down, and moving. One contractor keeps the substructure, walkways, rotary table, blow out preventer, and swivel assembly all on one load.

As soon as the hole is finished, the blowout preventer is removed and put on the derrick floor as is the swivel with goose neck and bail. The rotary table remains in place ready to rotate again as soon as the substructure is skidded in place. The walkways which form part of the derrick floor are raised slightly to remove the braces which are hinged to the substructure, and are then lowered and the braces folded into the substructure.

When the truck is ready to load the assembly, the two loose pieces are chained fast, and the entire assembly hoisted up onto the truck. The procedure is reversed when the substructure is spotted over the next location and this section is ready for operation again in a very short time.

HOW TO—Build Efficient Steel Utility House

Ease of setting up and ability to open the entire side of the unit are the principal features of a compact, all-steel, portable utility house employed by one company for installation at each drilling location. Skid-mounted, the structure is designed to permit the opening of two large doors on each side. The two doors, constituting almost the entire side of the house, are hinged at the top. When the doors are raised to the horizontal position, diagonally mounted supports of two-inch pipe are installed. Simplifying the work of readying or closing the house is the method used for installation of the pipe supports.



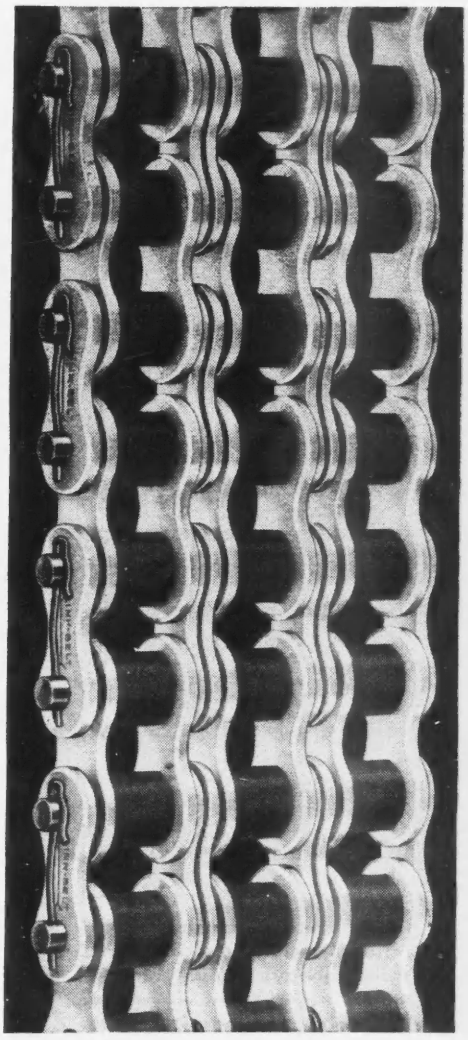
The supports fit into sockets permanently attached to the lower corners of the doors and recessed sockets welded into the side of the house. The flush sockets, one visible in the lower left corner of the house, eliminate exterior projections that might become broken during the normal moving or handling between locations.

The portable house in the illustration is used for housing two electric light plants and storage of miscellaneous equipment and supplies that must be kept dry and protected from the sun when not in use. The ability to raise the doors in awning fashion provides protection from rain, and shade during the summer season. Opening doors on each side of the house provides cross ventilation and accessibility.

The heavier your load — the greater your need for...

LINK-BELT

Precision Steel ROLLER CHAIN



It's a long way down to the "business end" of holes these days . . . often between three and four miles. That makes a round trip of close to six to eight miles. With drill pipe loads approaching 200 tons, the call is for better and more powerful drives. Link-Belt Precision Steel Roller Chain is the answer.

So well has this strong, flexible, precision finished all-steel chain performed—under the toughest drilling conditions throughout the world —it's popularity has leaped ahead among the men who build, the men who buy, and the men who operate drilling rigs.

Link-Belt Precision Steel Roller Chain is built to manufacturers' (A.S.A.) specifications in standard sizes, in single and multiple widths. Meeting all drilling requirements, Link-Belt chain is available at your supply store.

> E-Z-ASSEMBLY <

Link-Belt engineers have developed a construction that makes assembly and disassembly of multiple-width chains in the field *much easier*. With this feature, load distribution across the width of the chain is maintained.

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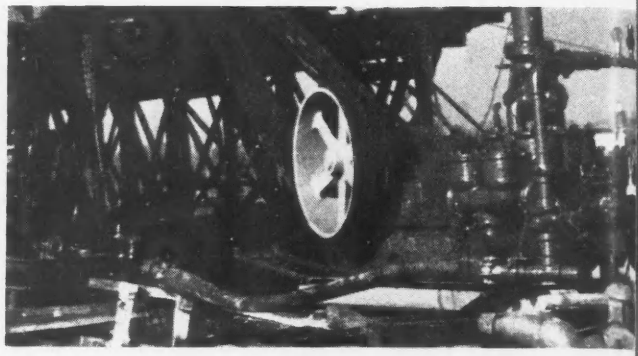
HOW TO—Cushion Mud Line Vibration



Two important functions were served when the owner of this small jackknife drilling rig added a 25-foot length of flexible hose to the mud line. Not only was much of the vibration in the mud line cushioned, but the flexibility of the hose permitted fast setup time.

The hose was fitted at either end with couplings similar to those on the rotary hose; one end was connected to the mud pump discharge, and the other to the mud lines in the substructure. The rubber hose did not absorb all the pulsations created in the drilling fluid system by the reciprocating mud pump, but it did reduce the vibrations attendant to such an installation due to movement of the pump parts and some settling in the soft ground.

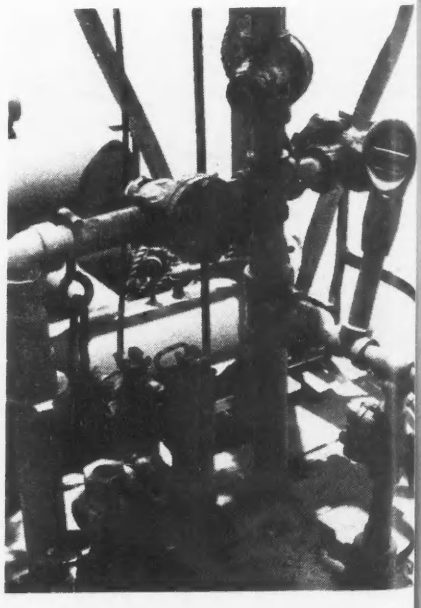
It also made the job of connecting up the mud lines to the pump an easy one, since it was not necessary to mate unions, and nipples of the exact length were eliminated. Elevation of the mud pump was therefore not critical, and it could be set on mats adjacent to the engine substructure. Distance rods maintained tension in the V-belts driving the power pulley, and the amount of hose permitted a wide variation in pump setting.

HOW TO—Avoid Downtime of Mud Pump

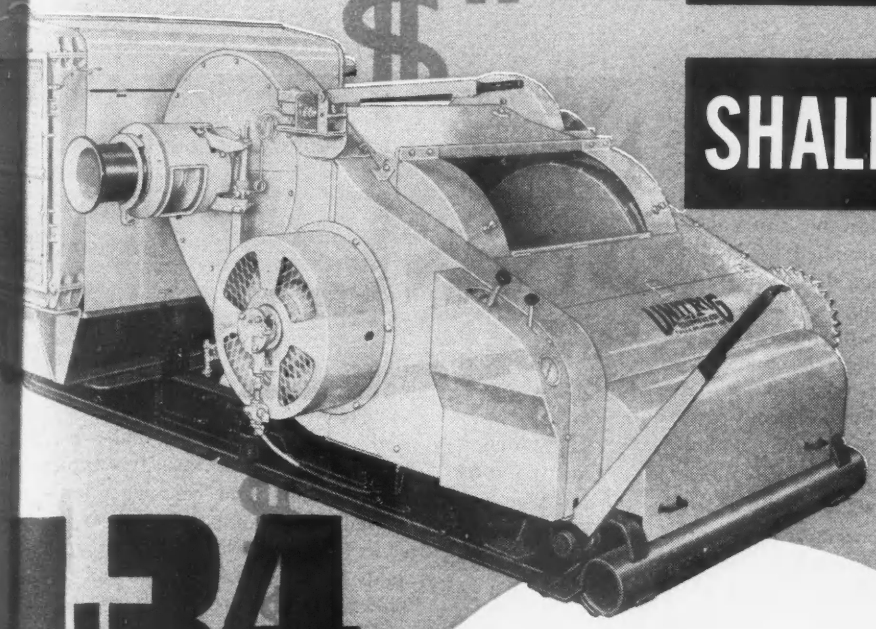
When a new joint of drill pipe is added to the drill stem during the drilling of a well, it is a common practice to shut down the mud pumps while the joint is made up and the kelly re-connected. This pump stoppage permits the possibility of losing prime on the pumps with a resultant delay in getting the mud back into circulation. It is particularly dangerous when the well begins to kick during this downtime of the mud pump.

To obviate such a condition, a simple tee connection and mud line valve can be added to the standpipe in order to divert the mud from the standpipe back to the mud pits. In this case, the mud pumps would continue to operate and mud would be circulated back into the sump.

All that is required is a connection into the standpipe with a tee and a new four-inch line added which leads to the pits. When a new joint is to be added, the valve on the return line is opened and the standpipe valve closed. If a sack of weighting material is added to the pit in the vicinity of the pump suction, the column of mud in the kelly should fall, leaving a dry joint when the kelly is broken out and the new joint added. The pumps can be brought to idling speed for a few minutes after the return line is opened to permit the kelly and drilling hose to clean themselves of fluid before the standpipe valve is closed.



A *Profit-Maker* ON SHALLOW WELL JOBS



U-34

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The U-34 is designed to make more money for both the contractor and producer when used for shallow well drilling. The U-34 met with instant success when it was introduced over a year ago, because of its speed and extra dependable performance. Write us for complete information on this small, compact unit. It can't be beat for drilling to 4,500 feet.

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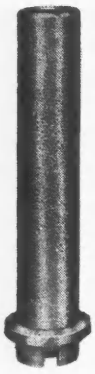

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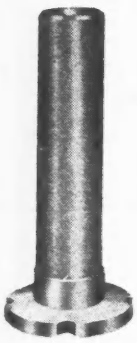
Made from finest quality alloy steels, heat-treated to carefully controlled hardness and precision machined and ground to exacting tolerances. The bright SMOOTH finish reduces friction, resulting in longer life of both the wash pipe and packing.



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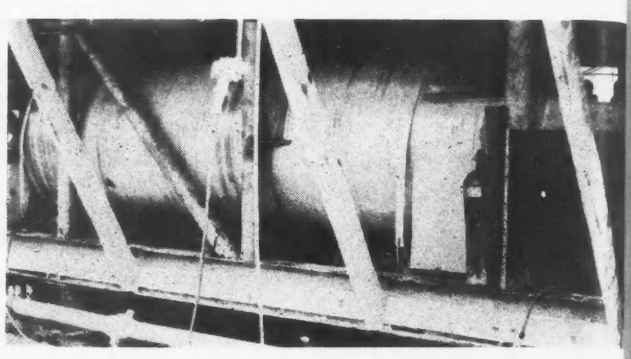
HOW TO—Convert Tank to Store Water

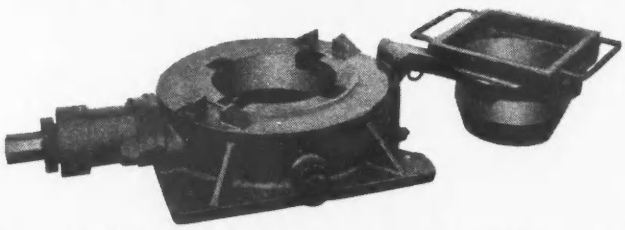


Water required for circulation through the hydraulic brake or in the water cooled drums of the hoist can be conveniently supplied by circulating through lines leading from a storage tank adapted by using a gasoline delivery truck tank outdated by modern volume requirements. This tank is mounted in the substructure as a permanent fixture, securely anchored by the truck mounting brackets to the sills of the derrick substructure. The loading and unloading connections can be readily used for pumping in and out, and the large manhole in the top can be used for refilling.

One handy feature of the truck tank is the compartment normally attache to the back of the vessel in which t funnels, cans and various tools a carried. This compartment can be us as a tool compartment and for storin small parts, pump packing and the lik The tank is prevented from becomi misplaced when moving by strap ir tie-downs which also are connected t the sills of the substructure.

Dependability Makes Big Four
THE BEST SLIM HOLE TABLE

Big Four Slim Hole Rotary Tables have all the features found in the largest rotaries . . . designed and manufactured with the same precision



The table has 21½" Bantam Ball Bearings, rated at 90,900 lbs. at 100 RPM. It is completely enclosed and operates in an oil bath. Standard rotary slips and kelly drive bushings (13½" square) can be used in the master bushings. Table and housing are cast alloy steel; machine cut for smooth operation and long life, ring gear and pinion gear are forged steel. Pinion shaft operates on two Timken bearings. The table bolts to the floor and when installed the top is level with the derrick floor. Two adjustable roller bearings hold the table down and prevent upward movement.

It will pay you to investigate Big Four before you invest in a slim hole table.

Complete information gladly given.
Write today.

BIG FOUR MACHINE AND SUPPLY COMPANY

CLAY CITY, ILLINOIS
Box 256

PAWHUSKA, OKLAHOMA
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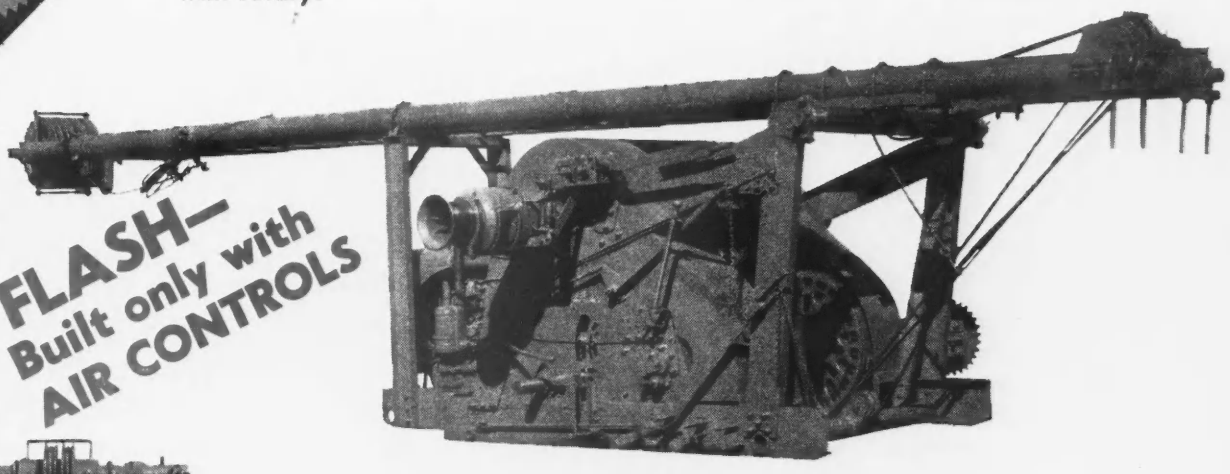
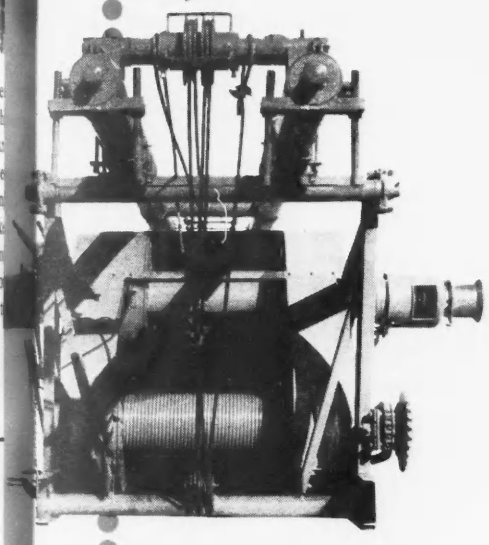
A-C ALLIS-CHALMERS

Here's a new rig that will give big unit performance on drilling and work-over jobs from 2000′ to 4000′. It's an ideal unit for drilling water wells with rotary.



FLASH— Built only with AIR CONTROLS



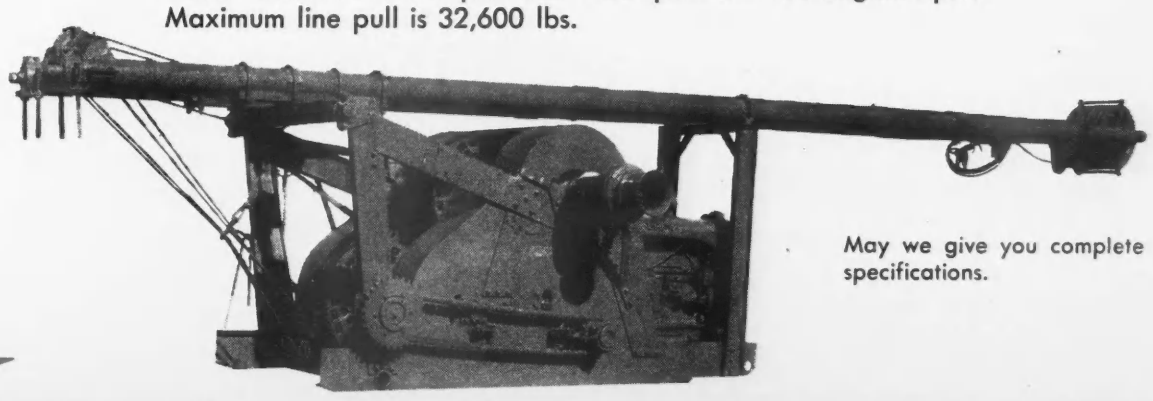
A *New* M318-32" RIG

FEATURES: Two drums — Friction and Break out hydraulic catheads — Foot or air operated clutches — Adjustable chain idlers — Front end starter switch and engine controls — Two pole telescoping mast. Racking board available. A compact well balanced unit. Easily removable catheads make unit meet all road width limits.

LOWER DRUM
FLANGES — 33″ diameter.
BARREL — 13″ diameter x 36″ long.
BRAKES — Two, 32″ diameter x 6″ face, removable rims, air cooled.
CAPACITY — ½″ line is 9360′, ¾″ line is 4150′.

UPPER DRUM —
FLANGES — 33″ diameter.
BARREL — 13″ diameter x 32″ long.
BRAKES — Two, 32″ diameter x 6″ face, removable rims, air cooled.
CAPACITY — ½″ line is 8000′, ¾″ line is 3580′.

Lower Drum has 8 line speeds to 1050′ p.m. at 1400 engine r.p.m.
Maximum line pull is 32,600 lbs.



May we give you complete specifications.

RED E. Cooper, Inc. TULSA, OKLA.

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SAFETY to men and materials?

LONG SERVICE LIFE under exposure to abrasion and weather?

ECONOMY in first cost or "services rendered?"

EASE OF HANDLING by reason of non-kinking, short link design?

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Double-Duty High Test Chain and you have *all* of these advantages working for you. Our best customers are those who gave Double-Duty Chain the "on-the-job" test.

WRITE US *for the name of the distributor nearest your office or field operations.*

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(Affiliated with Chisholm-Moore Hoist Corp.)
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St. Catharines, Ontario and Johannesburg, S. A.

HOW TO—Add Catwalk to Offshore Rig

Offshore drilling structures are designed with sufficient space from which to drill several wells. As each well is drilled and completed, the entire rig and derrick are skidded over about ten feet and another well is drilled. Normally, the rig is skidded away from the drilling tender which carries supplies and mud pumps, and houses personnel.

The derrick is mounted on an elevated substructure which is high enough from the platform's main deck to accommodate blowout preventers, and well head equipment when the well is completed. As the rig is skidded away from the tender, the catwalk, or what would correspond to the catwalk on land rigs, must be extended to support equipment which is brought from the tender to the rig floor.

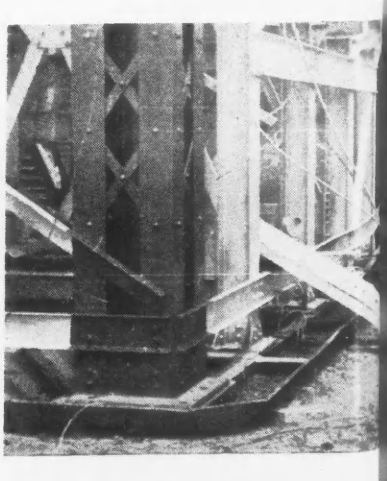
This problem can be solved as illustrated by adding ten-foot sections of four-inch pipe framework which is adequately braced and designed to pass over the completed well head equipment. These sections are welded and equipped with a heavy timber topping to protect casing and drill pipe ends. The near section containing the inclined platform is always bolted to the substructure, and

the added section is placed betwee and the last remaining flat section. T sectionalized catwalk is bolted to structure where the skid runners tact the framework of the drilling form.

HOW TO—Combine Foundation and Ski

Where several wells are to be drilled in the same vicinity, it will sometimes pay the contractor to prepare the base of the substructure for skidding. By using skids which have a large bearing surface against the ground, the need for mats, etc. under the derrick corners is eliminated.

Made from half-inch plate material and six inch I-beams, the "pontoons" are not difficult to construct. After careful measurements are taken of the footing of the substructure, the I-beams are welded in rectangular shapes so that every edge of the footing is suported, with the beams extending out eight inches from each of the legs. A flat piece of plate is then cut to make the bottom of the pontoon and welded to the I-beams. Sides are formed by taking ten-inch strips of plate material and welding to the bottom pieces at a 45-degree angle, so that the rig can skidded forward or sidewise. The cor are cut on a miter and plates welde so that the rig will not dig into ground when pulled at a diagonal a for a short distance.



THE *New* GUIBERSON TYPE J DRILLING HEAD

with FULL-FLOATING WASHPIPE

Increased load-carrying capacity... the ideal tool for drilling-in, reverse circulation and clean-out operations.

Check these improved features!

WASHPIPE PACKING ASSEMBLY IS TAMPER-PROOF

•

NO PACKING ADJUSTMENT REQUIRED AT ANY TIME

•

ROTATION IS IN EITHER OR BOTH PACKINGS FOR LONGER PACKING AND WASHPIPE LIFE

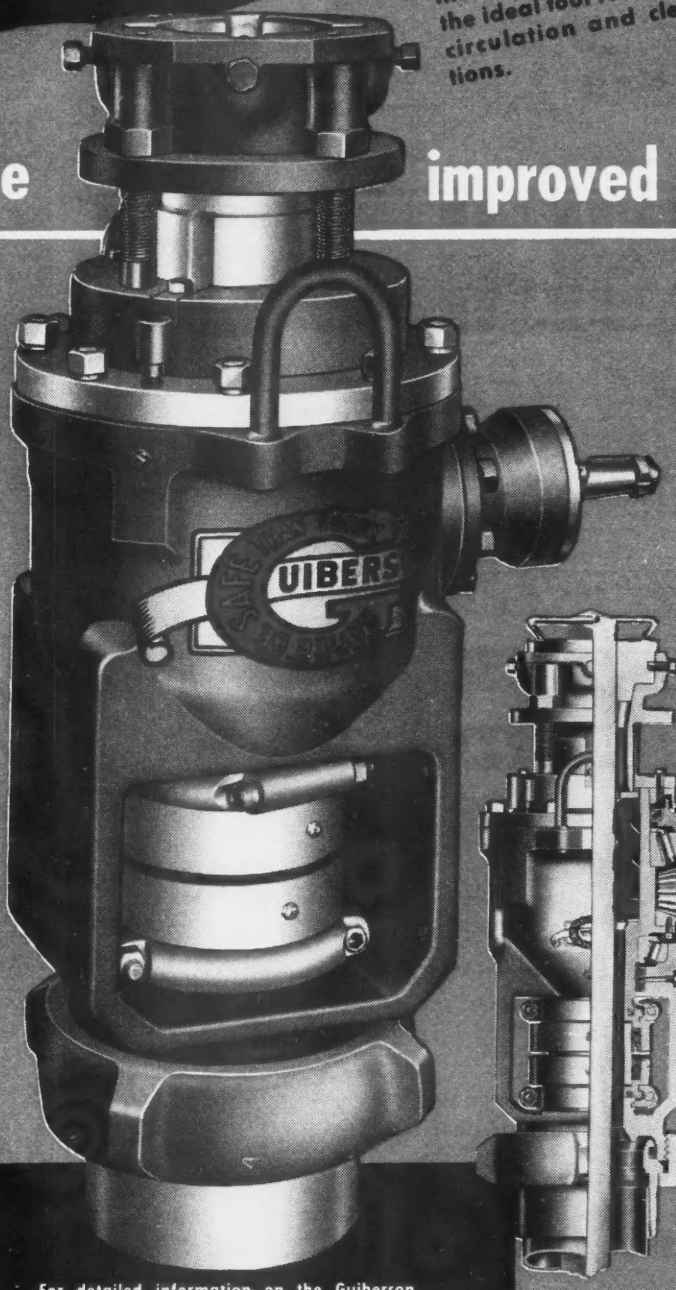
•

NO MUD OR DRILLING FLUID CAN ENTER HOUSING

•

REINFORCED HEAD WILL NOW HANDLE TUBING STRINGS UP TO 8,000 FEET IN DEPTH

•



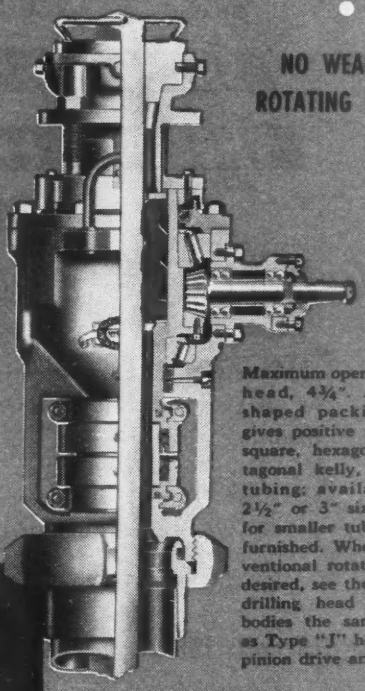
PACKINGS EQUIPPED WITH LUBRICATION FITTINGS

•

ASSEMBLY PACKING REPLACED WITHOUT DISMANTLING HEAD

•

NO WEAR ON ROTATING SPINDLE



Maximum opening through head, 4¾". Accordion-shaped packing rubber gives positive seal around square, hexagonal, or octagonal kelly, as well as tubing; available in 2", 2½" or 3" sizes; rubbers for smaller tubing can be furnished. Where the conventional rotating head is desired, see the Type "K" drilling head which embodies the same features as Type "J" head without pinion drive and gear.

For detailed information on the Guiberson Type J Drilling head, write or call the Guiberson office nearest to you.

SAFE THAN SORRY GUIBERSON BETTER BE

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California Distributor: The W. R. Guiberson Co., 717 East Gage Avenue, Los Angeles 1. Export Office: 30 Rockefeller Plaza, New York City 20.

Sold by Leading Oil Field Supply Stores Everywhere

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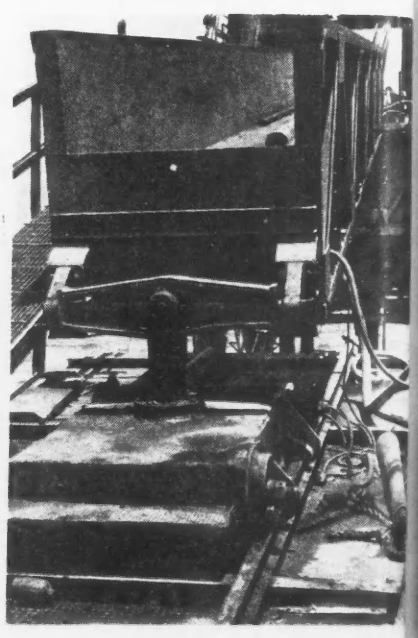
THE GUIBERSON CORPORATION

DALLAS, TEXAS — ESTABLISHED 1919

HOW TO—Connect Floating Tender to Offshore Platform

Combining a drilling rig with an ocean-going vessel has provided the engineer with many complex problems, some of which still remain unsolved. Connecting a movable drilling tender to a stationary drilling structure in the open sea is difficult in itself, as practically all directions of motion must be compensated for in the satisfactory design of such a connector.

Illustrated is one method now used for providing a means of transferring



personnel and equipment from the floa ing drilling tender to the rigid drilli platform. Essentially, it is a long stru turally-supported bin, hinged at the pla form to accommodate movement in t horizontal and vertical direction, a affixed to the floating tender by a piv system which is anchored by two ra road tracks.

The walkway for personnel was bu into the unit which was supported two main I-beams. Bearings we mounted on these beams to accept heavy cross arm which is pivoted at center as shown. This pivot rested o sturdy upright column which was flang to a four-wheeled truck. The tru equipped with small railroad type whe was anchored to the tracks by f brackets which were welded to frame. These brackets hooked under t outboard edge of the track with su cient clearance to permit the truck move forward and backward, but h it to the tracks which were welded the floating tender.

This type of design on the bow of t tender permitted movement in every rection. In case of hurricane weath the tender could be disconnected fr the connector by pulling the pivot and lifting the structure with the dra works.

Superior!
SERVICE
SAFETY
SPEED
The McKISSICK Safety FLOOR BLOCK
Patented adapter permits perfect conformity of sheave and line as line spools from winch drum.
14" — 18" — 20" Sheaves, single Hyatt, double Hyatt, or double Timken Bearings.
Capacities to fit your requirements.
FOR EVERY PURPOSE.....McKISSICK BUILDS A BETTER BLOCK
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McKISSICK PRODUCTS CORPORATION
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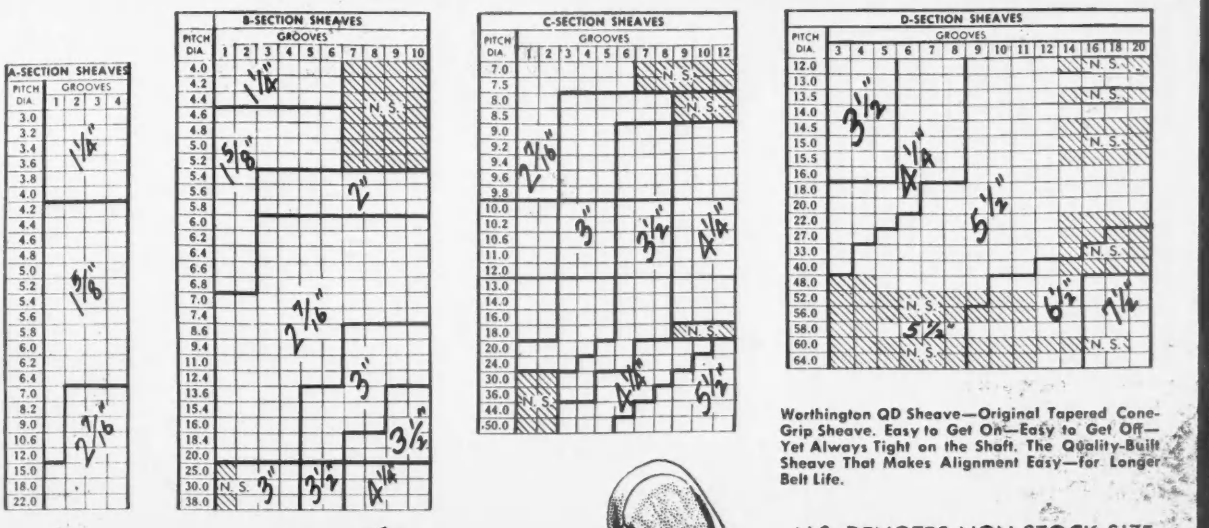
THE GOOD RIGHT HAND OF INDUSTRY

STOCK SIZES WORTHINGTON HEAVY DUTY "QD" SHEAVES WITH MAXIMUM BORES INDICATED



Worthington QD Sheave—Original Tapered Cone-Grip Sheave. Easy to Get On—Easy to Get Off—Yet Always Tight on the Shaft. The Quality-Built Sheave That Makes Alignment Easy—for Longer Belt Life.

N.S. DENOTES NON-STOCK SIZE

$2,500,000 INVESTED IN STOCK

to deliver your sheave immediately

As long as it takes our distributor's shipment to get there is as long as it takes—in most cases—to get exactly the sheave you need into your hands. Your Worthington distributor has practically any stock size you'd ever call for—if he hasn't, one of the Worthington warehouses will get it to him in 24 hours or less.

Check your sheave requirements. With more sheaves listed as "stock sizes" and more sizes in stock than any other distributor, your Worthington distributor may be able to save you the cost of a special sheave.

Top-ranking distributors in the oil fields handle Worthington QD Sheaves and Worthington-Goodyear V-belts. They are backed by Worthington warehouses whose stocks duplicate the factory stock at Buffalo—more sizes stocked than any other sheave on the market. With 853 sizes in "A", "B", "C" and "D" section, ½ to 600 hp, you can fill almost any rpm requirement with a *stock* sheave. Also: 332 listed stock sizes of EC Cord V-belts.

So, when you need sheaves, call your local oil-field dealer.

For Balanced Drive Performance

Specify Worthington Multi-V-Drives, with QD Sheaves and Worthington-Goodyear EC Cord V-belts. (Goodyear EC Cord or Steel Cable V-belts are used exclusively in Worthington Multi-V-Drives.)

WORTHINGTON

WORTHINGTON PUMP AND MACHINERY CORPORATION

MULTI-V-DRIVE SALES DIVISION

Buffalo, New York—General Offices: Harrison, New Jersey

The Good Right Hand of Industry

POWER TRANSMISSION: sheaves, V-belts, variable speed drives

PUMPS: centrifugal, power, rotary, steam

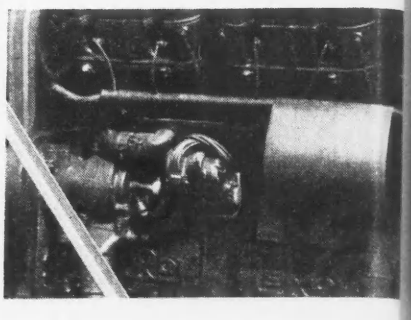
AIR COMPRESSORS: water-cooled, air-cooled

MVS9-2B

HOW TO—Protect Magneto on Outside Drilling Engines

On drilling engines installed outside the derrick and engine house where they are exposed to sudden showers, the magneto can be safely covered with a rain-proof shield at little cost. The company welder with a tinsmith torch can cut and weld the cover in a short time. Installed in place the cover serves as insurance against a shorted high tension wire.

Material used is thin, black, sheet metal, similar to stove piping. The cover



resembles a shanty "lean-to" and is made of only three pieces: the end sections and the formed cover. One end piece is solid and is intended to bear against the breaker end of the magneto while the other is cut away so it will fit between the magneto and the universal drive fitting. The cover is a continuous sheet, bent to match the rounding edges of the end pieces with an overhang at the top which is subsequently cut and shaped to act as a hook to be placed over the conduit carrying the spark plug wires. As the metal is thin, the completed unit weighs only a few ounces and because of its hook type hangers, it can be readily removed when the magento requires servicing.

If you don't, send for them right now, while you're thinking about it. They are free—no obligation—and we believe you will find them helpful and informative.

They're chock-full of practical selection tables, charts, and technical information on Harrisburg Seamless Steel Pipe Couplings and Drop-Forged Steel Pipe Flanges.

We think everyone interested in these two important items of oil field equipment should have these catalogs on file. Use the coupon, or write us a postcard or letter.

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Harrisburg Steel Corporation, Harrisburg 8, Penna.

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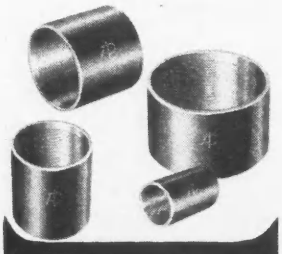
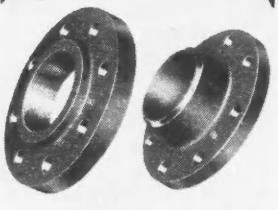
SEAMLESS STEEL PIPE COUPLINGS (MADE TO A.P.I. SPECIFICATIONS)



FIRST BECAUSE THEY'RE FINEST



DROP-FORGED STEEL PIPE FLANGES (MANUFACTURED TO A.S.A. STANDARDS)

Harrisburg STEEL CORPORATION
HARRISBURG 8, PENNSYLVANIA

96 YEARS IN PENNSYLVANIA'S CAPITAL

HOW TO—Close Preventers

A positive source of pressure, in addition to the mud pumps, for opening and closing the blowout preventers this combination steam pump and pressure fluid chamber. While some operators rely on the pressure in the mud system or water system to operate blowout preventers, the device shown was designed to perform this operation through the use of hydraulic oil. In using oil, it was felt that minimum wear on the blowout preventers would result and this separate unit provided a positive means of controlling the important preventer equipment.

A small double-acting, duplex steam pump has been adapted to operate on compressed air. The fluid end of the pump handles the oil which pressures

H. H. EDWARDS COMPANY — SEATTLE • PORTLAND • SAN FRANCISCO • LOS ANGELES • HOUSTON

1. **Slip the pin through the clevis and chain**

2. **Spread the cotter**

...and you're ready to put this grab hook to work!

It's a rugged, heat-treated drop-forged hook with a quick-fastening jaw that does away with shackling... cold-shutting... cutting, bending and rewelding chain.

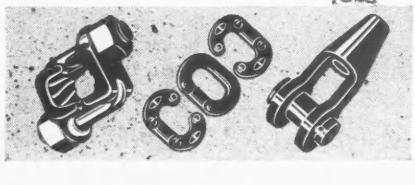
Safer, too... stronger than ordinary grabs, Laughlin's Clevis Grab Hook also has a forged housing that protects hands from cotter pin.

No other grab hook saves so much time... so *safely!*

Write for Laughlin's Catalog 145... data book of the fitting industry. THE THOMAS LAUGHLIN COMPANY, DEPT. 23, PORTLAND 6, MAINE.

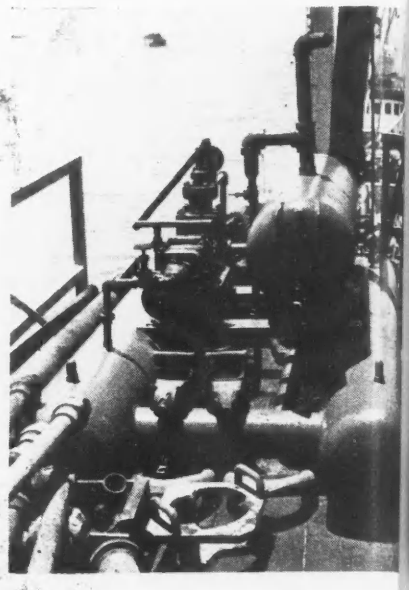
LAUGHLIN

THE MOST COMPLETE LINE OF DROP-FORGED WIRE ROPE AND CHAIN FITTINGS



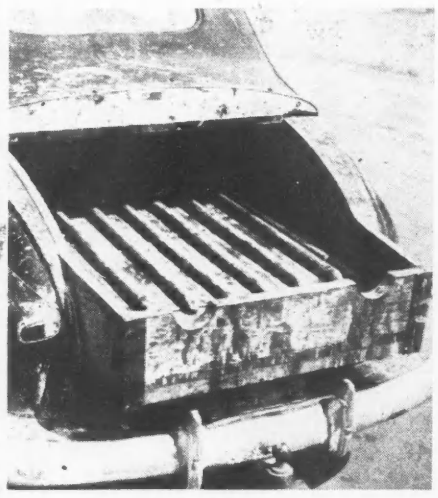
the blowout preventer control system. The rig is equipped with air clutches, switches, etc., which are fed through an air system by a compressor. To insure a sufficient volume of air to close the preventers, two large volume tanks were placed below the hydraulic oil reservoir. These two tanks are connected in parallel by two cross pieces of eight-inch casing. This construction serves as a skid for the complete unit which facilitates moving it from location to location. A check valve in the air feed line prevents the escape of air back into the system should the line pressure drop below the desired pressure to operate the pump.

The unit is sturdy in construction and compact, occupying only a small area in one corner of the derrick. It could easily be placed below the substructure or at some other convenient location.



HOW TO—Make Tool Compartment Floo

Prevention of rolling or skidding of heavy tools in the rear compartment of light pickup cars is a common problem and one that is handled in a variety of ways. One company found it advantageous, and relatively inexpensive, to



floor the bottom of the oak-lined compartment with a sheet of heavy gauge steel, and to weld to this sheet a series of longitudinal sections of 1½-inch pipe in the manner shown. Ends of the pipe sections are tapered or rounded off to facilitate sliding tools in or out of the compartment. Distance between the pipe skids is determined by the average diameter of the tools most likely to be carried, but the average ranges between four and eight inches.

Such a lining in the bottom of the compartment replaces at little more expense the conventional flat steel wear strips that ordinarily are laid along the cracks between planks. The sheeting and pipe lengths can be welded and installed in the box as a unit, to simplify the work of building the compartment.

LOOK
INTO THE EARTH
MORE CLEARLY
MORE COMPREHENDINGLY
MORE PROFITABLY
WITH A
KLAUS GEOPHYSICAL SURVEY

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LUBBOCK, TEXAS

Here is Plain PROOF...

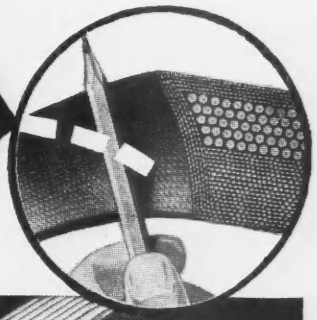
You can actually *feel* the sides of a belt *change shape* as the belt bends.

That the

CONCAVE SIDE

(U. S. Patent No. 1813698)

SAVES Transmission DOLLARS

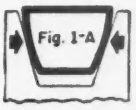


When a *straight-sided* V-Belt bends around a pulley, three things are bound to happen.

(1) The top of the belt, being under tension, *narrows.* (2) The body of the belt, under compression, *widens.* (3) The sides of the belt *bulge out.*

These *shape changes* are inevitable. They are shown in figures 1 and 1-A, below.

Straight-Sided V-Belt.



How Straight-Sided V-Belt Bulges In Sheave-Groove.

Because this bulging belt does not fit the sheave groove, two facts become clear. (1) The belt will get excessive wear where it bulges—*shorter life!* (2) The whole side of the belt cannot *uniformly* grip the pulley—*a loss in drive efficiency.*

How different the V-Belt with the precisely engineered *concave* side (U.S. Patent No. 1813698)—the Gates Vulco Rope. As this belt bends it assumes a shape that *exactly* fits the sheave groove. (Figures 2 and 2-A, below.)

Gates Vulco Rope with Concave Side.

No Side Bulge. Precise Fit In Sheave-Groove.

Two savings result. (1) The Gates Vulco Rope wears evenly—*longer life!* It's entire side-wall grips the pulley—no slip—*full delivery of power!*

The Mark of SPECIALIZED Research

The Concave Side is MORE IMPORTANT NOW Than Ever Before

Because the sides of a V-Belt are what actually drive the pulley it is clear that any increased load on the belt means a heavier load that must be transmitted to the pulley directly through the belt's sidewalls.

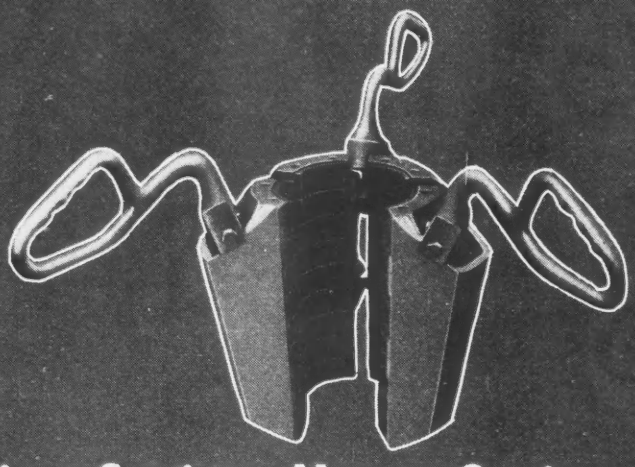
Now that Gates *SPECIALIZED* Research has made available to you SUPER Vulco Ropes—carrying fully 40% higher horsepower ratings—the life-prolonging Concave Side is naturally more important in conserving belt life today than ever before.

498

GATES VULCO ROPE DRIVES
Engineering Offices and Jobber Stocks IN ALL INDUSTRIAL CENTERS of the U. S. and 71 Foreign Countries

THE GATES RUBBER COMPANY
DENVER, U.S.A.
"The World's Largest Makers of V-Belts"

LIGHT.... and Lightning Fast



Time-Saving, Money-Saving Kinzbach-Ajax Unit Slips Offer Complete Protection and Safety

These new Kinzbach-Ajax Type UBL Unit Slips are lighter, faster, easier to handle . . . yet they retain all features necessary for complete protection to pipe strings and safety in drilling operations. Full length contact is maintained between slip backs and rotary bushing, so that full benefit is derived from available pipe gripping area; four segment construction provides extreme flexibility and even distribution of load; interchangeable inserts permit several sizes of pipe to be handled with one set of backs; segments are hinged to prevent cocking and binding, with gripping accomplished by true radial closure; ample fluid drain-back is provided.

The Type UBL Unit Slip weighs 155 pounds . . . the lightest unit slip available with all these outstanding features. Full information will be sent upon request.

KINZBACH TOOL COMPANY
INCORPORATED
P. O. BOX 277 • HOUSTON, TEXAS

EXPORT OFFICE
74 Trinity Place,
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KINZBACH TOOL CO INC

HOW TO—
Skid Derrick

When it is more economical to sk a jackknife or standard rig to an off location, one method of keeping the "solid," with the blocks and lines place is shown. The kelly is taken do and a joint of drill pipe is screwed i

the female joint on the bottom of swivel.

The elevators are then taken out the hook and put on the bottom of joint of drill pipe upsidedown, with links hanging down. The drive bushi are removed from the rotary table, the links of the elevator thrust d through the hole. A joint of old pipe or four-inch pipe is then pla through the lower ends of the links a strain taken on the derrick lines. T brings the rig into compression an will not sway or tend to lossen up w being skidded.

HOW TO—
Reduce Vibration

Whipping of kelly, swivel and tra ing block can be reduced considera by the inexpensive method employed one drilling company. A length of s line, one end of which is attached the crown block base and the ot secured to a weight which is free move up or down in a limited sp beneath the derrick floor, is pas through a small pulley attached to

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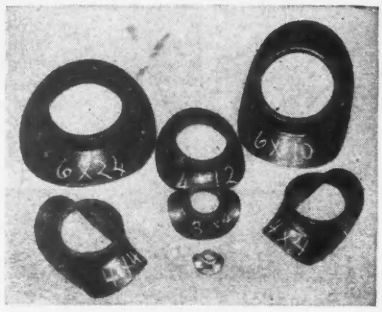

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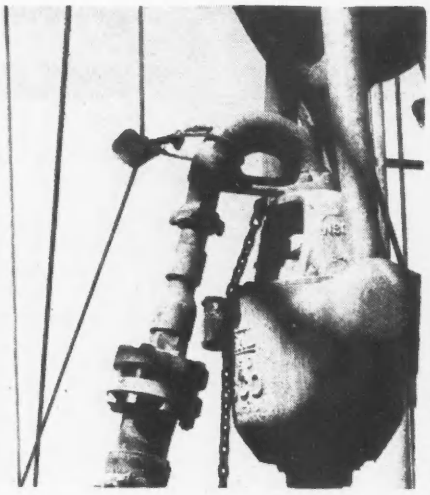

swivel neck in the manner illustrated. Regardless of the position of the swivel, the weighted cable tends to remain taut, thus effectively snubbing much of the damaging vibration which often occurs at that point. The system does not interfere with the breaking out and rat-holing of the kelly, and when it is removed a minimum of work is involved.

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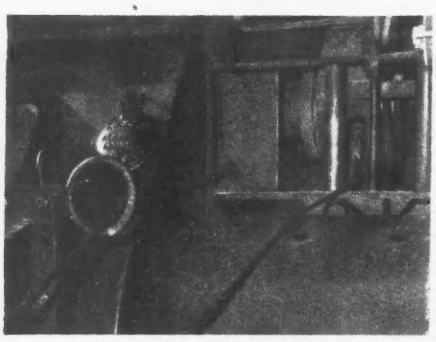
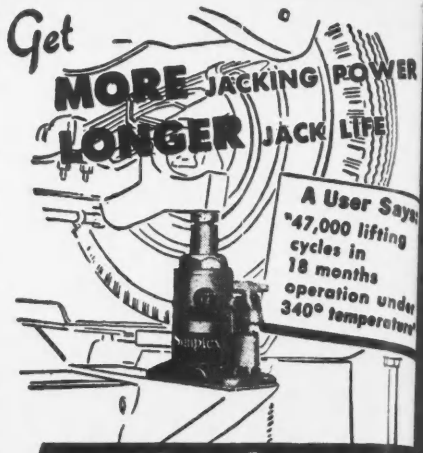


about six inches in diameter, and is equipped with a flat piece of strap steel which serves as a handle or supporting arm.

This arm is drilled so that bolt holes match up with flange bolts on the chain guard. Two such eyes have been employed; one as shown, and a second at the flanged section on the chain guard near the rotary. These eyes prevent the jerk line from flopping over the chain guard and possibly fouling with equipment or projections on the guard.



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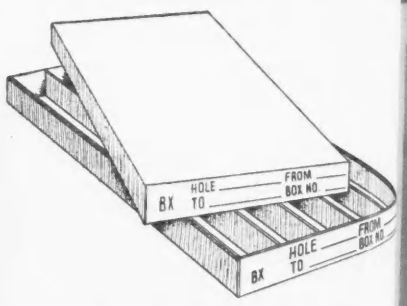

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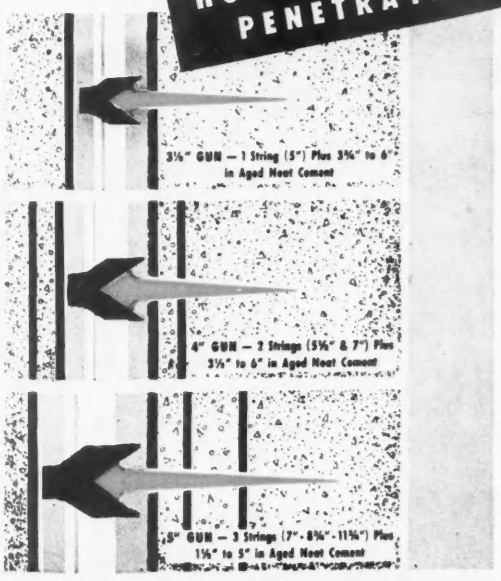
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Well Counterbalance

By L. G. FENN

Jensen Brothers Manufacturing Company

THE tremendous annual cost to oil operators as the result of improper well balancing in pumping operations is represented by excessive pumping unit repairs, short belt life, high power costs, short engine life, excessive oil consumption, and many other factors, all contributing to well down-time and reduction in oil produced.

Proper well balancing is absolutely essential to secure maximum production and to achieve full economy from modern pumping equipment. To emphasize this, compare the old style rig front, or walking beam, with a present-day pumping unit. Both are equipped with Samson post, beam, saddle bearing, tail bearing, pitman, crank, gear or belt reduction, etc. However the principal difference is that the old style rig fronts were not originally designed for counterbalance beyond the effect obtained from the massive flywheels of the slow speed single cylinder engines used to drive them. A system of effective counterweights made it possible to use a much smaller engine, as well as a smaller speed reducer, which resulted in a more compact machine, and therein lies the start of the development of what we now term a pumping unit.

Continuing with the comparison, consider the identical well load on both machines. Referring to Figure 1, if the well load results in a ten-horsepower peak, then the full stroke cycle of the rig front will start at zero power, build up to a ten-horsepower peak, and then return to a zero input. A balanced pumping unit under these conditions would start at zero, build up to five horsepower at "A" (Figure 1), return to zero, build again to five horsepower at "B," and return to zero in completing the stroke. Considering this example, basically we have used a ten-horsepower peak once on the rig front, and on the pumping unit we have used a five-horsepower peak twice. Now, were we to take the five-horsepower motor used to drive the pumping unit and hook it up to the rig front the torque would be insufficient for the rig front to make even a single turn.

Since the rig front must have nearly twice as large an engine or motor as the pumping unit then it must also have belts and speed reducers in proportion. Likewise, if the counterweights were omitted from a pumping unit, an engine or motor large enough to run it could also wreck the machine due to that unit's lighter construction.

The ideal condition required in a pumping unit would be a design that would act to further reduce the peaks to a more constant horsepower input. For example, instead of the unit hitting two peaks, as at points "A" and "B" in Figure 1, if it could be made to hit four peaks each half as high, a smaller motor could be used and it would carry a more constant load. The larger the motor or engine required for a given load, the lower the efficiency. This results in either a higher operating cost or a greater initial investment, or both.

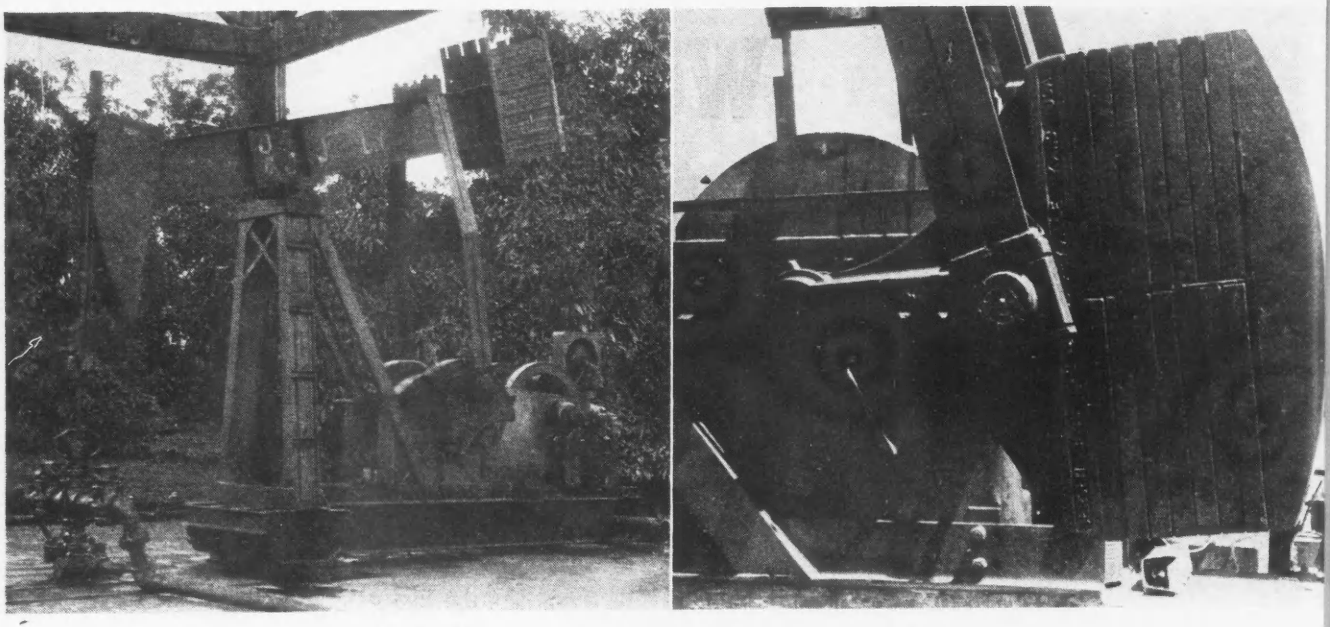
After considering the principles illustrated in Figure 1, it is clear that it is almost impossible to think of unit balance without considering horsepower and vice versa. In order to achieve ideal conditions in well counterbalancing it is necessary to understand the problems involved in the operation.

The well load consists of two distinct values termed the "static" load and the "dynamic" load. The static load represents the well at rest, or the dead load hanging on the unit. When this load is in motion, or pumping, it is termed the dynamic load.

The static load consists of three principal factors. First is depth of pump setting. This is to show how high the fluid must be lifted and is expressed in terms of feet and occasionally in pounds pressure.

Second is bore of the pump used. This value times the depth, or head, gives the volume of fluid hanging on the unit.

THE AUTHOR sets out to clarify certain operating points to impress operators, and especially field men who actually operate the equipment, with the importance of proper well balancing. The subject is presented in a non-technical manner, and touches on certain principles which must be understood and applied for successful production practice.



LEFT. Fully beam weighted unit, operating 16 strokes per minute.

RIGHT. Crank balanced unit, showing type of crank employed where weights are added to crank. Length of stroke is 36 inches, operating at 2 strokes per minute.

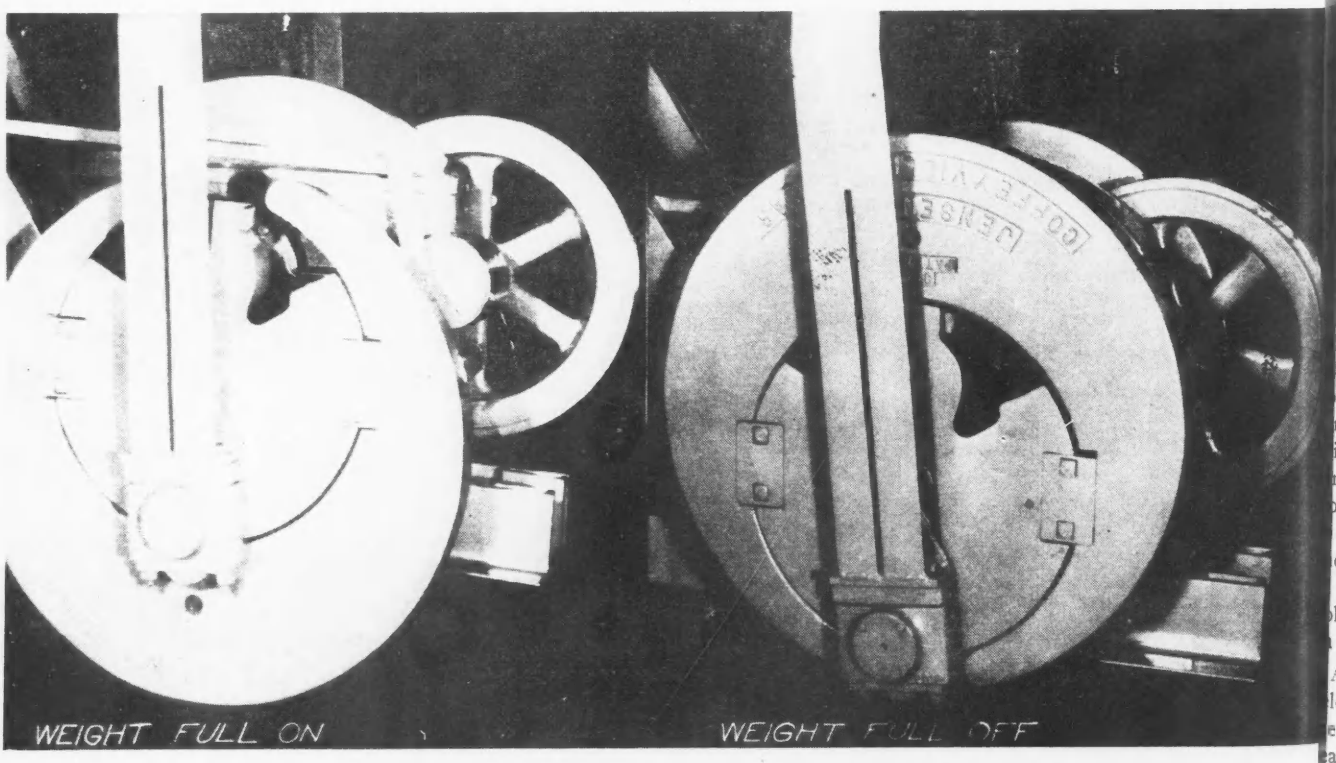
This volume times the weight per gallon of the fluid gives total fluid weight on the unit, which is usually based on water.

Third is size of rods used, a factor that must be known so as to determine their weight. In other words the operator must first know how much dead weight is involved in the problem. This dead weight multiplied by a factor arrived at from length of stroke times stroke per minute will give the dynamic load.

For balance purposes we are primarily interested in the static load since the portion we can counterbalance consists of the total weight of the rods plus one-half the weight of the column of fluid. If this amount of fluid weight is exceeded, the height of peak "A" is increased and the height of peak "B" is decreased (Figure 1). If all the fluid value is not weighted out, then peak "B" increases with a corresponding decrease in peak "A." There are other minor factors to be considered in the well load, but for the sake of simplicity and so as to more sharply emphasize the basic principle involved, these will not be discussed.

There are two distinct types, systems, of counterbalances employed a pumping unit. Often a combination the two is used. It is therefore necessary to understand the principles of each order to recognize their advantages and limitations because, as every operator field man knows, each well presents its own individual problem.

The two major types of counte



Crank balanced unit, showing type of crank used that permits shifting of crank weight to obtain balance.

balances used are commonly referred to as the beam balance and the crank balance. There are also several variations of each, but this article is primarily concerned with the basic principles involved in their use.

The beam balance is the simplest and was perhaps the first type employed. It normally consists of a series of weights that may be added to or removed from the beam in such a manner that a balance with the well will be secured. Figure 2 shows that there usually is a ratio between the beam weight and the well weight due to a difference in the leverages of "A" and "B." This difference will vary from around 0.5 to 1 up to 0.75 to 1, depending on make and model of unit. In other words, for every pound of well load to be balanced one-half pound of beam weight, or whatever the ratio may be, will be required.

The principal advantage of the beam weight balance is that when at rest it is in tension with the well at any and all points of the stroke. (Consider Figure 3 at positions "A," "B" and "C.") This makes for a most satisfactory type of balance when used for relatively slow pumping speeds. Another advantage of this type balance is that the unit can be started with a smaller engine or motor due to its characteristic of being in balance at all points of the stroke.

However, as pumping speeds are increased and the unit stroke is lengthened, this type of balance develops some very detrimental effects. Again referring to Figure 3 and considering that great velocity has been added to the weight as in high speed pumping, it can be imagined what a tremendous load this weight could develop when suddenly reversed at points "A" and "C." Extreme cases have been noted where this condition was more detrimental to gears and belts than was the actual well load.

The limitation of this type of balance is therefore based on speed and length of travel. It is found that on the smaller units of from 1000 to 4000 pounds polish rod rating and with from nine-inch to around 18-inch stroke lengths, they will operate satisfactorily up to as high as 40 strokes per minute. On the other hand, machines of 20,000 or 22,000-pound polish rod rating and having a 70- to 74-inch stroke will usually start dealing out misery when operated above 14 or 15 strokes per minute. Other well conditions may also develop which can add to the difficulties. As a rule, the velocity should never exceed five feet per second of the weight box and it is advisable to hold below four feet per second or less on a fully beam-weighted unit.

An easy way of determining the velocity of the weight box is to take the stroke length and divide it by the beam weight ratio (Figure 2). This value

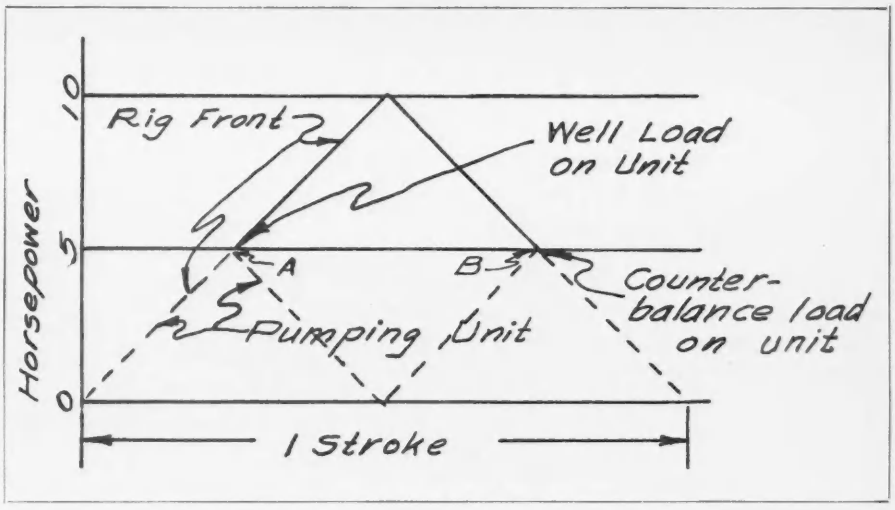


FIGURE 1

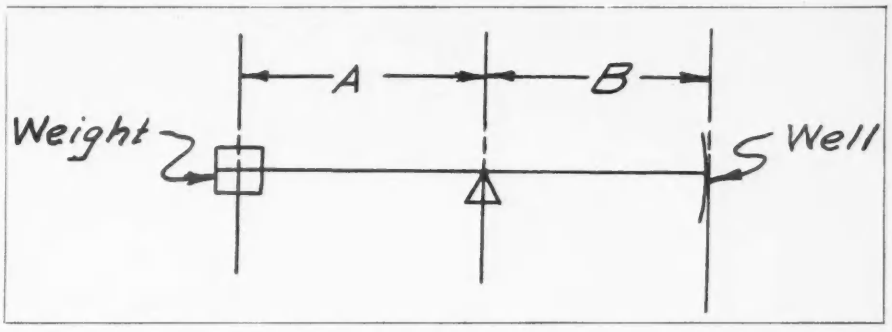


FIGURE 2

will give the length of travel and when multiplied by the operating speed per second the velocity of the weights can be determined. For example, assuming a machine operating 20 strokes per minute on a 36-in. stroke and a weight ratio of 0.6 By dividing 36 by the 0.6 ratio we obtain 60 inches, or five feet, which is the distance the weights travel going a full upward or downward stroke. (This is one-half of the total stroke cycle of the unit.) Operating at 20 strokes per minute, a complete stroke is made every three seconds, which moves the weight twice through its five-foot length, or the weight moves five feet in 1½ seconds. Thus, in one second the weight will have moved 40 inches or 3⅓ feet, which is well within the limits of efficiency.

Rotary Weight Type

In the crank type counterbalance, or rotary weight, is a balance ideally suited for conditions which are the reverse of those encountered with the beam weight. Unlike the beam weight, the crank type counterbalance moves in and out of balance with the well at extremely slow speeds; but above this point the inertia developed in the mass, or weight, levels off these peaks. It would be proper to visualize the beam weight as a "static" balance and the crank weight as a "dynamic" balance. The slower it is operated the more effective is the beam weight, while the reverse condition is obtained in the case of the crank weight.

Referring to Figure 4, it can readily been seen that with the crank weight at positions "A" and "B" the weight will have reached its maximum values in balancing the well. At points "C" and "D" its weight effect on the well will be at a minimum. However, when operating at normal or high speeds the crank weight is absorbing energy from the motor across points "C" and "D" which is expended as it passes through positions "A" and "B," thereby smoothing out the peaks encountered from the various positions.

After considering this principle it may readily be seen that the faster the crank operates the smoother will be its action due to its inertia. Theoretically, the crank could be speeded up until it would produce an action comparable to a solid flywheel.

Large pumping units that are required to operate at fairly high speeds are suited for this type of counterweight. Another factor is that the weight mass will absorb much of the well shock encountered and thus protect the gears. However, on slow pumping wells a larger engine or motor will be required

for a rotary balance than on a beam balanced unit due to its higher starting load requirement. It is necessary for the motor to move the weights across points "C" or "D" (Figure 4) without any help from the well and before they have developed any inertia.

Having considered the principles involved, the following examples are presented to demonstrate their application:

Assume we are operating a well pumping from 3000 feet equipped with a 1½-inch insert pump and five-eighth-inch rods and that it is necessary to operate at 36-inch strokes, 20 per minute, to obtain the necessary fluid. The rods weigh 1150 pounds per 1000 feet for a total rod weight in this well of 3450 pounds. The column of fluid of a 1½-inch pump (based on water) weighs 633 pounds per 1000 feet or a total weight of 1899 pounds. Since the counterbalance load of the well consists of the weight of the rods plus one-half the weight of the fluid column, the load necessary to balance out totals 4400 pounds. From this weight it will first be necessary to deduct the balance effect of the stripped unit, which is assumed to be 800 pounds, leaving a net weight of 3600 pounds to be counterweighted.

Beam Weights

At this point it must be decided whether to use beam weights or crank weights to achieve balance. Since this machine is comparable to the one used in the example for determining beam weight velocity and we find that it will run well within the operating limits, then beam weights should be used on this well. Since our weight ratio was 0.6 to 1, we multiply the 3600-pound load by 0.6 and arrive at 2160 pounds of beam weights necessary to balance the well.

Since the pump has been set at 3000 feet the fluid level is assumed to be at

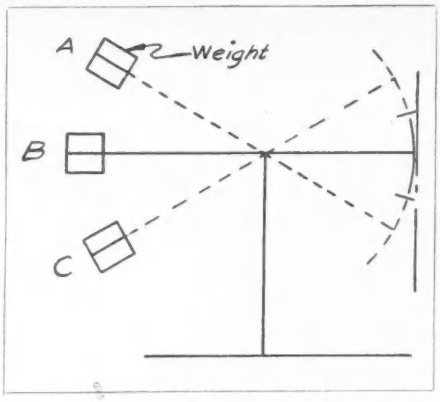


FIGURE 3

the same depth, although this is seldom the case unless the well pumps off completely. Since the weight of the fluid is dependent upon the height of the fluid level there generally will be several weights too many. But as the pumping life of the well progresses the fluid load generally becomes heavier so that ultimately a large percentage of these extra weights will be used.

As another example, take a 3000-foot well that requires faster pumping to obtain the necessaary fluid and assume that the well is equipped with 2½-inch tubing, 2¼-inch inside diameter pump, ¾-inch rods, with 60-inch pump strokes at 20 per minute. The total rod weight will amount to 5070 pounds and the fluid column 4680 pounds. Since counterbalance load is weight of rods plus one-half weight of the column of fluid the well load to be balanced amounts to 7410 pounds. Deducting the balance effect of the stripped unit, assumed to be 1010 pounds, results in a total of 6400 pounds to be counterweighted. In considering beam weights for this job, first check the weight velocities. Assuming a weight ratio of 0.6 to 1 and a stroke length of 60 inches, we find the weights will travel 100 inches in each direction which, at 20 strokes per minute, will give a velocity of 5½ feet per second. This speed being beyond the assumed limits, crank weights are indicated to balance the 6300 pounds. To determine the amount of crank weight necessary to balance this load, the operator need only refer to the unit manufacturer tables covering the particular machine to be used which will either show amount of weight necessary or position at which to place the weights on the crank.

When the machine is in operation the balance should be checked so as to compensate for possible changes that may occur under running conditions. If powered by an electric motor the balance will check with a clamp-on type ammeter; if powered with a multicylinder engine a direct reading tachometer placed on the engine shaft will indicate an accurate balance. If powered with a single cylinder engine employing very large flywheels it will be difficult to check the balance accurately.

As every pumper realizes, no two wells present identical operating conditions and many pumping wells develop peculiarities which require constant attention. Before deciding on the type of unit to be used the well should be carefully studied. Too frequently an operator will follow the general trend in pumping practices in a particular field without considering carefully the well's individual problems. Assuming that the correct unit and proper counterbalance have been installed, it will pay to check the latter every 60 to 90 days so as to meet changing conditions which experience shows may vary greatly in a short period. Proper counterbalancing will in the long run result in less operating cost and more oil in the stock tanks.

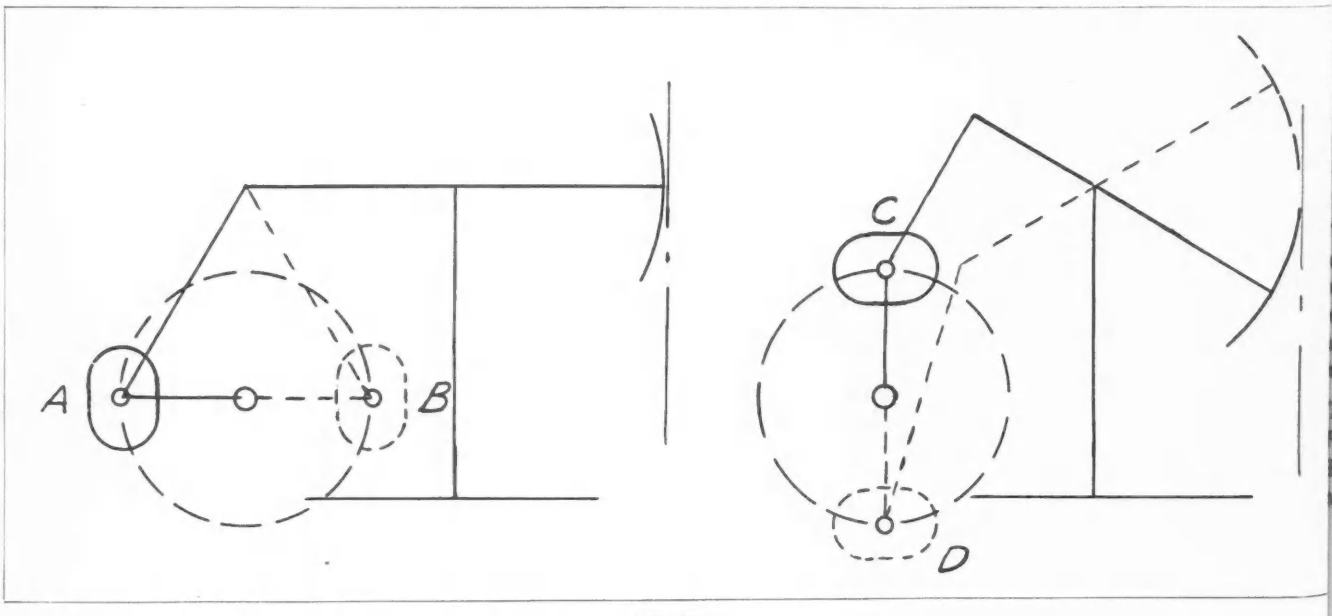
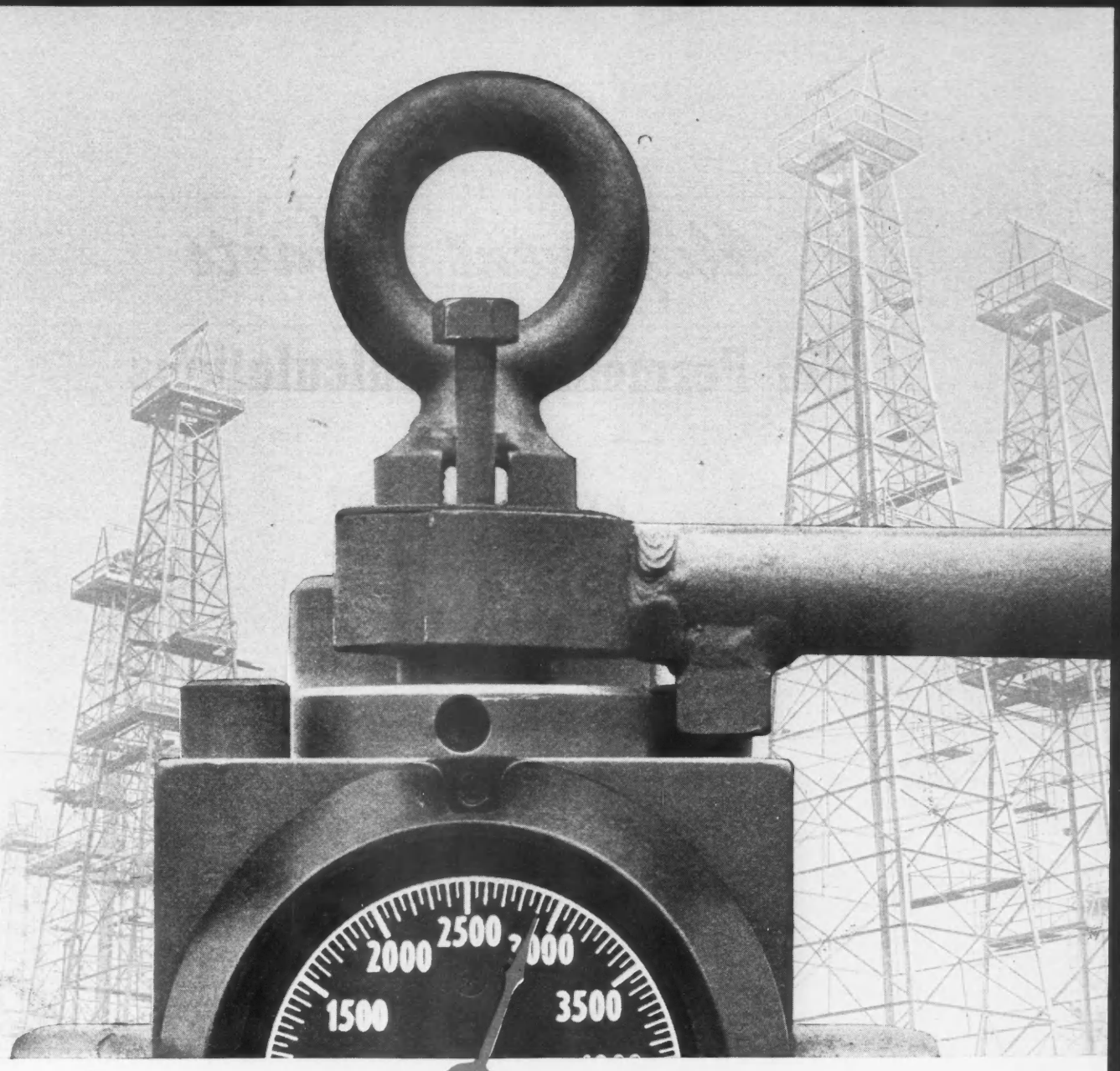


FIGURE 4



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THESE ARE THE DAYS OF FREE PUMPING

Alignment Charts For Permeability Calculations

By WILLIAM D. ELLIOTT

THE AUTHOR presents alignment charts for simplification of the calculation of test plug permeabilities and develops the equations from which basic data are derived. The article was prepared especially for WORLD OIL and based on a brief discussion of a graduate problem presented before a joint meeting of the Oklahoma Section, AIME, at the University of Oklahoma, Norman, Okla.

IN almost every type of experiment involving oil-producing media the permeability of the conductivity of fluids must be known. There are many varied methods of finding this permeability but all methods present an involved calculation. A great deal of time is saved and chance of error eliminated if this long calculation is simplified to as few terms as possible. Most laboratories have their own method of simplification but some are and some are not as accurate as the data warrant. This paper presents an easy, accurate calculation for each of two general methods now employed within the industry. Since all routine analysis permeability determinations are conducted with dry air, only that fluid will be considered.

The alignment charts were designed for gas measurement by water displacement (Figure 1), and for volume displacement using burettes where air displaces air or use of the orifice measurement device (Figure 2), if atmospheric pressure is always the downstream and air measurement pressure.

These charts are used to find a correction factor which, when multiplied by a constant and two other variables, will determine the permeability of test plugs. Arbitrary values of 74 cm. of mercury barometric pressure, and an air temperature of 20° C., were selected as the base for construction of the charts. At these values the only correction factor involved on the water displacement chart is that for the vapor pressure of water, if the air is measured over water. For any temperature other than 20° C., the correction is for the vapor pressure of water and the change in viscosity of air. For any barometric pressure other than 74 cm. of mercury the chart adds the necessary correction. The volume displacement chart omits the water vapor pressure correction. Since most all determinations use one of several differential pressures, constants were determined for each (Table 1). If a water manometer must be used, a graph of the constants is available (Figure 3).

TABLE 1

Constants for 1.85 cm. diameter plugs.

ΔP (Cm. Hg.)	Constants
4	6229
8	3034
20	1127.1
40	503.6
60	303.4

Derivation of Formula Used

For water displacement, Figure 1

The formula used for permeability measurements for a liquid are given by Muskat[1] as:

$$k = \frac{\mu \bar{Q} L}{A(P_1 - P_2)} \qquad (1)$$

Where:

- k = permeability in darcys
- μ = viscosity of liquid in centipoises
- L = length in cm.
- A = area in cm.^{2}
- P_1 = inlet pressure in atmospheres
- P_2 = outlet pressure in atmospheres
- $\bar{Q}$ = rate of flow in ml/sec (outflow).

If a gas is used, it must be measured at the mean pressure of flow. Therefore, if the gas is measured at P, then:

$$k = \frac{2\bar{Q} L P \mu}{A(P_1 + P_2)(P_1 - P_2)} \qquad (2)$$

but if k is in millidarcys, the pressures are measured in cm. of Hg., and Q is measured at P_2, then:

$$k = \left(\frac{\text{ml}}{\text{Sec}}\right)\left[\frac{2 \times P_2 \times L \times 76 \times 1000\,\mu}{(P_1 + P_2)(P_1 - P_2)\,A}\right] \qquad (3)$$

If the gas is exhausted over water and if

- μ_s = viscosity of gas at 20° C.
- α = change in viscosity due to temperature = $(\mu - \mu_s)$
- P_s = standard barometric pressure (74 cm. Hg.)
- β = vapor pressure of water, cm. of Hg.
- P = barometric pressure
- γ = variation form standard pressure = $(P - P_s)$

equation (3) equals:

$$k = \left(\frac{\text{ml.}}{\text{sec.}}\right)\left(\frac{76 \times 2 \times (\mu_s + \alpha)(P_s + \gamma) \times L \times 1000 \times (1 - \beta/P)}{A \times (P_1 + P_s + \gamma)(P_1 - P_s - \gamma)}\right) \quad \text{Equation (4)}$$

All of the terms in Equation (4) a[re] The partial

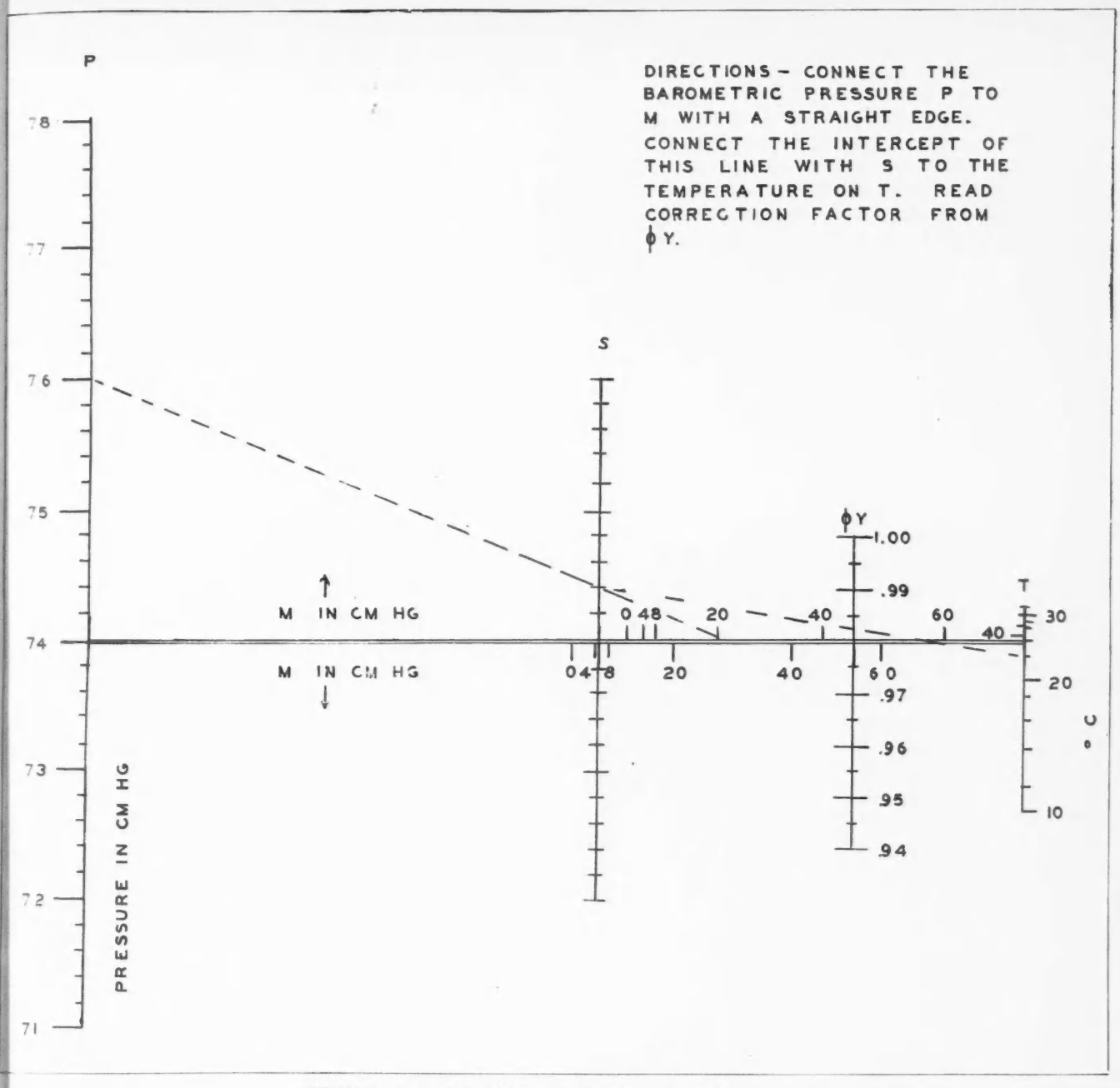

FIGURE 1. Permeability alignment chart for water displacement.

self-explanatory except for the term $(1-\beta/P)$. This term corrects the ml. measured for the vapor pressure of water. The partial volume of the vapor of a liquid is given by the formula:

$$V_v = V\frac{\beta}{P} \quad \text{(Ref. 2)} \qquad (5)$$

where:

V_v = partial volume of vapor

β = partial pressure of vapor = the vapor pressure of the liquid at the existing temperature.

V = total volume

P = total pressure.

The partial volume of gas would then be equal to

$$V - V_v = V - V\frac{\beta}{P} = V(1-\beta/P) \qquad (6)$$

where V is the ml. of Equation (4).

Equation (4) is unwieldy and must be simplified. It should be set up under standard conditions with as few variables as possible that may be multiplied by a correction factor. Equation (4) may be set up as:

$$k = \left(\frac{\text{ml.}}{\text{sec.}}\right)\left(\frac{76\times 2\times L\times 74\times \mu_s\times 1000}{A\times M\,(M+2\times 74)}\right)\left(\frac{(1+\alpha/\mu_s)\,(1+\gamma/P_s)\,(1-\beta/P_s)}{1+\frac{2(P-P_s)}{(M+2P_s)}}\right) \qquad (7)$$

The terms $(1+\alpha/\mu_s)$ and $(1+\alpha/P_s)$ are obtained by dividing $(\mu_s+\alpha)$ and $(P_s+\alpha)$ by μ_s and P_s, respectively. Very little error is introduced if P is made equal to P_s in the term $(1-\beta/P)$ of Equation (4). $(P_1-P_s-\alpha)$ is equal to the manometer reading or M and therefore $(P_1+P_s+\alpha)$ is equal to $M+2P$. By proper substitution Equation (7) is worked out.

If a constant diameter of plug is used and a constant amount of air is measured, then Equation (7) may be simplified to

$$k = C\times\phi Y\times L\times\frac{1}{\text{sec}} \qquad (8)$$

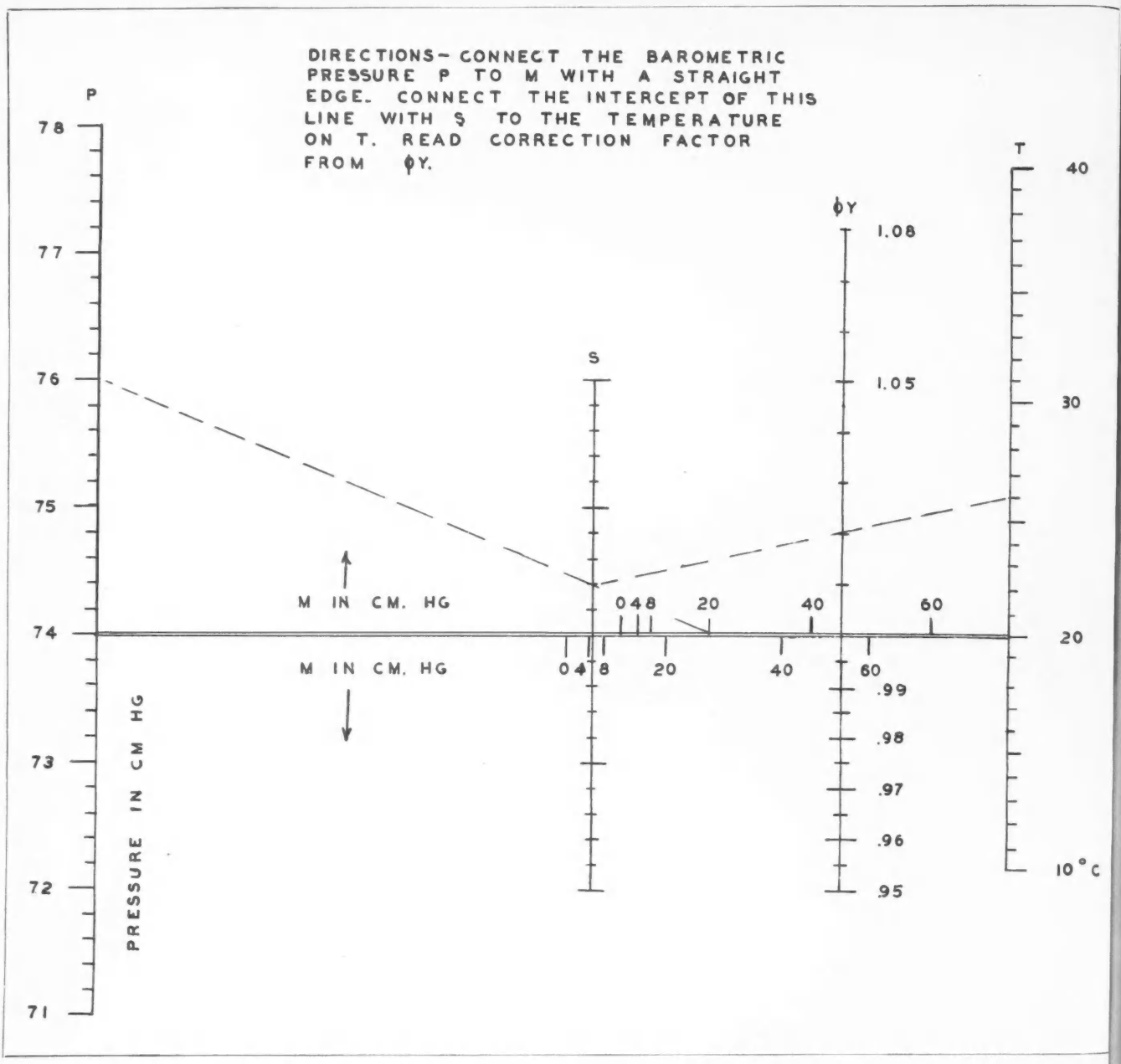

FIGURE 2. Permeability alignment chart for volume displacement.

if:

$$C = \frac{76 \times 2 \times 74 \times 50 \times 1000 \times .01808}{A \times M(M+148)} \quad (9)$$

$$\phi Y = \frac{(1+\alpha/\mu_s)\,(1+\gamma/P_s)\,(1-\beta/P_s)}{1+\left[\frac{2(P-P_s)}{M+2P_s}\right]} \quad (10)$$

then

$$\phi Y = (1+\alpha/\mu_s)\,(1+\gamma/P_s)\,(1-\beta/P_s)\left[\frac{M+2P_s}{M+2/P_s+2P-2/P_s}\right]$$

Equation (11)

$$= (1+\alpha/\mu_s)\,(1+\gamma/P_s)\,(1-\beta/P_s)\left[1+\frac{2(P_s-P)}{M+2P}\right]$$

Equation (12)

by discounting all second order terms

$$\text{Eq } 13 = \phi Y = 1+\frac{\alpha}{\mu_s}+\frac{\gamma}{P_s}-\frac{\beta}{P_s}+2\frac{(P_s-P)}{M+2P}$$

$$\phi Y = 1+\frac{\alpha}{\mu_s}+\frac{\gamma}{P_s}-\frac{\beta}{P_s}+\frac{2(P_s-P)}{M+2P} \quad (13)$$

$$=\left[\frac{\alpha}{\mu_s}-\frac{\beta}{P_s}\right]+\frac{\gamma}{P_s}+1+\left[\frac{2(P_s-P)}{M+2P}\right] \quad (14)$$

$$\phi Y = \left[\frac{\alpha}{\mu_s}-\frac{\beta}{P_s}\right]+\left[\frac{(P-P_s)}{P_s}+\frac{M+2P_s}{M+2P}\right] \quad (15)$$

If the formula for

$$\alpha = -0.00099 + 0.00004975\ t \text{ (for air)}$$

(Ref. 3) (16)

and the approximate formula for

$$\beta = 0.743 - 0.0162\ t + 0.00335\ t^2.$$

(Ref. 3) (17)

Therefore:

$$\phi Y = (-0.0646 + 0.002954t - 4.53 \times 10^{-5} t^2) + \left[\frac{(P-P_s)}{P_s}+\frac{M-2P_s}{M-2P}\right] \quad (18)$$

where t is in °C.

From this equation the chart is ma for φY in Fig. 1. (Ref. 4).

For volume displacement Figure 2

Volume Displacement Formula

The derivation of the formula f volume displacement is identical to t water displacement except β equals zer This substitution should be made i Equation (15).

For the constants, Table 1 and Figure 3

The constants are calculated fro

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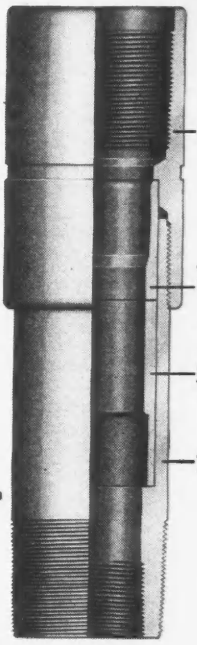

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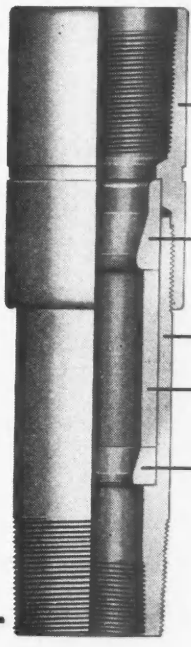

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Equation (9). M must be in cm. of Hg. A diameter of 1.85 cm. was chosen as the standard diameter and the constants were calculated on that basis. Table 1 gives the constants for five settings of differential pressure measured in cm. of mercury. Figure 3 shows a graph of differential pressures measured in cm. of water vs. the constants.

The permeability may be determined from:

$k = C \times \phi Y \times L \times (1/sec)$ (From equation (8) in the derivation)

Where:

C is from Table I or Fig. 3.

ϕY is from one of the alignment charts. (Fig. 1 or Fig. 2)

L and time are from the data of each determination.

Examples

Example I: 50 ml./20sec., 2.5 cm. length, 1.85 cm. dia., $\Delta P = 40$ cm. Hg., 26° C., 75.4 cm. Hg. Barometric Pressure.

By use of chart. (Figure 1)

$$\frac{503.6}{20} \times 2.5 \times 0.985 = 62.024 \text{ md.}$$

By calculation

$$\frac{50 \times 76 \times 75.4 \times 2 \times 0.01839 \times 1000 \times 2.5\,(1 - 2.52/75.4)}{20 \times 2.688 \times 40 \times (150.8 - 40)} = 62.063$$

0.032 percent error in chart

Example I Chart Figure 2

$$\frac{503.6}{20} \times 2.5 \times 1.021 = 64.272$$

By calculation

$$\frac{50 \times 76 \times 75.4 \times 2 \times 0.01839 \times 1000 \times 2}{20 \times .688 \times 40\,(40 + 150.8)} = 64.208$$

0.0934 percent error in chart.

Example II: 50ml./20 sec., 2.5 cm length, 1.85 cm. dia. P = 40 cm water, 32° C., 72.8 cm. Hg. Barometric pressure.

By use of chart. (Figure 1)

$$\frac{8430 \times 2.5 \times .984}{20} = 1037.1$$

By calculation.

$$\frac{50 \times 76 \times 72.8 \times 2 \times 0.1848 \left(1 - \frac{3.57}{72.8}\right.}{20 \times 2.688 \times 2.941\,(2.941 + 145.6)} = 1035.$$

0.2 percent error in chart and graph

Example II. Chart (Fig. 2)

$$\frac{8430 \times 2.5 \times 1.032}{20} = 1087.7$$

By calculation

$$\frac{50 \times 76 \times 72.8 \times 2 \times 0.01848 \times 2.5}{20 \times 2.688 \times 2.941\,(2.941 + 145.6)} = 1088.$$

0.008 percent error in chart and graph

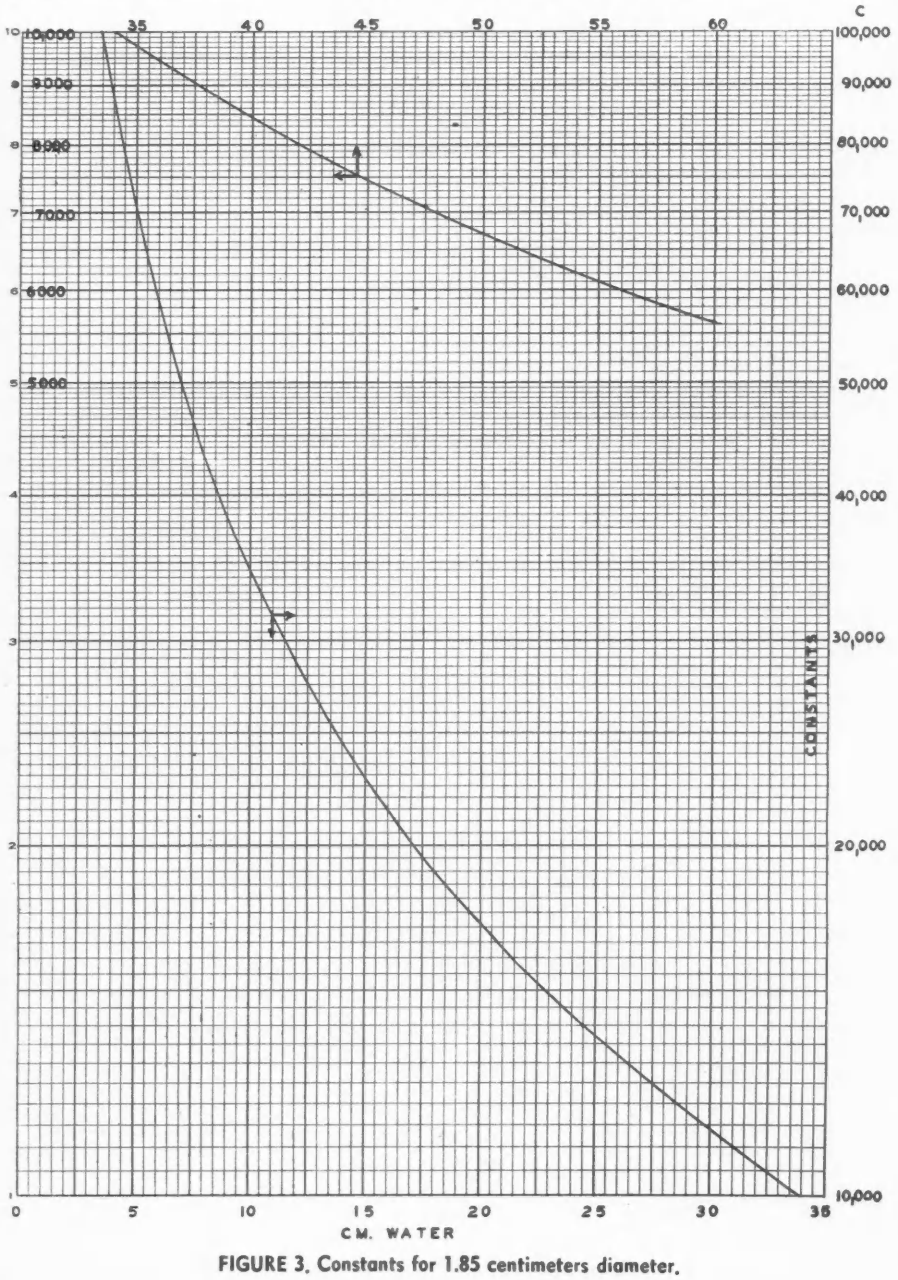

FIGURE 3. Constants for 1.85 centimeters diameter.

Summary

The alignment charts give an easy simple method of the calculation of the permeability of test plugs, and is the most versatile, yet the most accurate of any previously shown in the literature. Most other methods either sacrifice accuracy, or simplicity to obtain any permeability calculation. Table 1 and Figure 3 were tailored for use in the University of Tulsa's Petroleum Engineering Department, but Equation (9) may be used to determine the constants for use in any laboratory. The alignment chart may be used in any laboratory using manometers having a centimeter scale. Any other manometer scale chart may be easily made by calculation of a similar chart using Equation (18).

☆

BIBLIOGRAPHY

[1] M. Muskat, *The Flow of Homogeneous Fluids Through Porous Media*, 1937, p. 78.

[2] O. A. Hougen and K. M. Watson, *Industrial Chemical Calculations*, 1936, p. 83.

[3] *Handbook of Chemistry and Physics*, 19... p. 1328 and pp. 1413, 1414.

Dale S. Davis, *Empirical Equations and Nomography*, 1943, Chapter I.

[4] Dale S. Davis, *Empirical Equations and Nomography*, 1943, Part II.

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Field and Laboratory Tests of

Sodium Chromates and Alkalies

for Controlling Corrosion in Gas Condensate Wells

Part 3

Maximum and Minimum Requirements of Sodium Chromate Determined

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TESTS of the use of sodium chromates and alkalies for controlling corrosion in the well in the Cotton Valley field were made over a period of 20 months from October 12, 1945, to June 12, 1947. Results obtained during the first six months to March 20, 1946, have been described in detail in a previous Bureau of Mines publication.[1]

The first test consisted of injecting 2.2 pounds of sodium chromate and 7.4 gallons of water into the casinghead of the well per million cubic feet of gas to flow to the bottom of the well and thence upward through the tubing to the wellhead. This treatment reduced the concentration of iron in the effluent water from 100 to four ppm and reduced the rate of corrosion of coupons exposed in the wellhead from 0.045 to 0.001 ipy. A lowering in the flow capacity of the well as a result of the deposition of reduced chromium compounds on the inner wall of the tubing near the inlet or lower end occurred during the two months that the treatment was in progress, and to remove this deposit, water only was injected into the casinghead for one month at the rate of 2.2 gallons per million cubic feet of gas flowing. During the period of washing, the iron content of the effluent water increased to an average of 27 ppm, and the rate of corrosion of the wellhead coupons increased to 0.014 ipy, indicating a rate of corrosion about one-third that which prevailed in the well before sodium chromate was injected into the flowstream. Flow of gas from the well decreased from 8.6 to 6.4 million cubic feet per day while the chromate treatment was in progress; subsequently, when water only was injected into the well, the rate of flow increased to 7.1 million cubic feet of gas a day.

Control Maintained

The first treatment provided an excess of chromates in the effluent water which averaged 540 ppm. Therefore, the test started on February 3, 1946, was carried on for more than one month to determine the degree of corrosion control when only 1.1 pounds of sodium chromate—one half as much as before—and 5.5 gallons of water were injected into the well per million cubic feet of gas. Although chromates did not appear in the effluent water, corrosion control was maintained—the iron content of the effluent water was 8 ppm, and the rate of corrosion of wellhead coupons was 0.011 ipy—and the flow of gas from the well continued to average 7.1 million cubic feet per day.

Table 7 contains a detailed summary of results of the first tests. In Column 1 the tests are identified by the year, month and day on which they were begun and ended. The test identified in the table as ending on March 10, 1946, was the last described in the first published report[1] on the field use of chromates. The data obtained showed what would happen when large and small quantities of chromates were used in treating the well. In most of the tests that followed and are described in this report, an intermediate quantity of chromates was used with varying quantities of water and alkali.

Columns 2 to 6, inclusive, of Table 7 give information on rates of injection and quantities of materials used in the treatments. In Columns 7 to 13, inclusive, are summarized the results obtained from measurements of properties of the effluent water, rates of corrosion, and effects of the tests on the flow capacity of the tubing. The criteria of merit of corrosion control for the individual treatments are given in Columns 11 and 12, which show concentration of iron in the effluent water and rate of corrosion of steel coupons exposed in the flowstream at the wellhead. Adverse effects of some of the treatments are recorded in Column 13, where a percentage measure of decrease in the flow capacity of the tubing indicates that residues of the treating materials accumulated in the flowstring while certain of the tests were in progress.

Figures 9 to 16, inclusive, show graphically the data obtained at the test well

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during the approximately 14-month period, March 21, 1946, to June 12, 1947. The figures were prepared in sections to show the relation of significant data as a function of time. The summaries of data shown in Table 7 were prepared from large-scale plots of these figures.

Measure of Flow Capacity of Tubing

Rate of gas flow, Q, from the well, plotted in Section A of figures 9 to 16, was not a reliable indication of the flow capacity of the tubing from month to month because the pressure in the pipe line connecting the well with the cycling plant varied occasionally with operating conditions at the plant. An approximate measure of the flow capacity of the tubing, designed to be independent of gathering-line pressure and rate of gas withdrawal from the well, was computed by means of the following function:

$$\frac{Q}{\sqrt{P_c - P_t}} \qquad (15)$$

where,

Q = rate of gas flow, million cu. ft. per day,

P_c = casinghead pressure, lb. per. sq. in., and

P_t = tubinghead pressure, lb. per. sq. in.

In designing this function, accuracy in expressing known laws of gas flow was sacrificed to gain simplicity. Although pressures were measured by means of a piston gauge, experience showed that, for a given obstruction in the tubing, the value of the formula is not constant and not independent of rate of gas flow as was intended and that it gives lower values at low rates of flow than at high rates of flow. Values of Function 15 plotted in Section D of Figures 9 to 16 provided a useful indication of change in the flow capacity of the tubing, but the fractional variation in the value of the function usually exceeded the fractional variation in the rate of flow Q for a given physical change in the flow channel as a result of the deposition of solids in the tubing.

For example, a change in the rate of flow from 7.5 on January 30 to 3.3 million cubic feet of gas a day on June 7, 1946, was accompanied by a reduction from 0.51 to 0.16 in the value of the flow-capacity function. For a reduction in the rate of flow of 56 percent, the value of the flow-capacity factor was reduced 68 percent. These differences in the measures of reduction in flow capacity prevailed although the back pressures in the pipe line to the well were the same. The flow factor is used throughout this report as a measure of the flow capacity of the tubing, although it shows a greater reduction in the flow capacity than actually occurs as a result of the accumulation of deposits on the inside of the tubing.

Volume of Solution Per Day

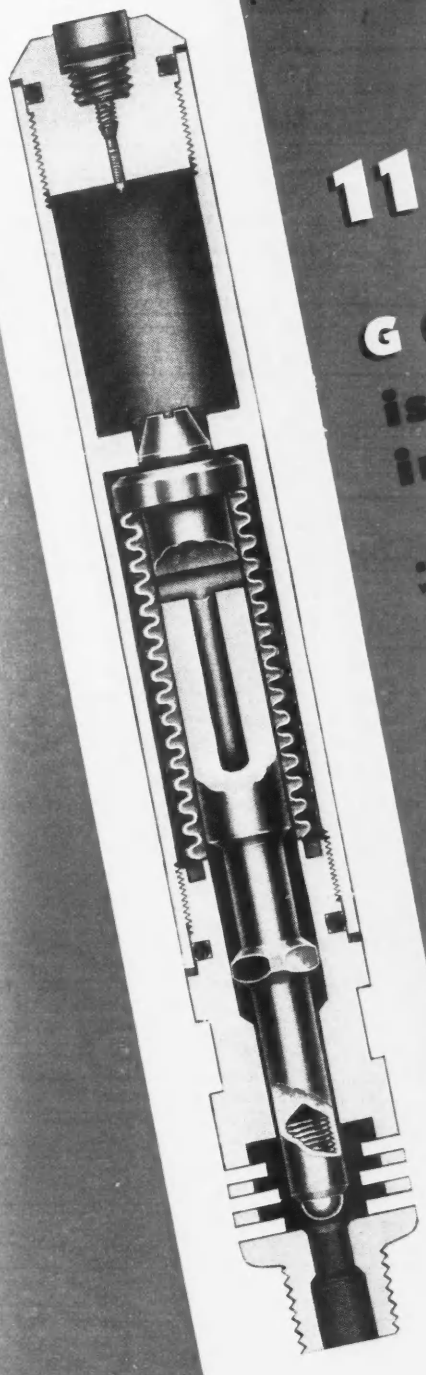
Data plotted in Section E of Figures 9 to 16, inclusive, show the volume of solution pumped into the well against pressure each day. Section F of the figures shows the weight of treating mate-

TABLE 7

Summary of Corrosion Control Tests at Cotton Valley Well; Averages

1	2	3	4	5	6	7	8	9	10	11	12	13	14
			INJECTION RATE				EFFLUENT WATER, P.P.M.						
	SOLUTION USED, LB. PER 100 GAL.												
Test Period, Year, Month and Day	Chromate	NaOH	Water, Gal. per Million Cu. Ft. Gas	Chromate, Lb. per Million Cu. Ft. Gas	NaOH, Lb. per Million Cu. Ft. Gas	Effluent Water, pH	Bicarbonate Radical, HCO_3	Total Solids	Sodium, Chromate, $Na_2CrO_4 \cdot 4H_2O$	Iron	Coupon Corrosion, i.p.y.	Change in Conductivity of Tubing, Percent Per Day	Rate of Flow of Gas, Million Cu. Ft. per Day
TESTS WITH Sodium Chromate, Na_2CrO_4 and SODIUM HYDROXIDE, NaOH													
Before Treatment	.....	.....	.....	.....	.....	6.1	60	260	0	100	0.045	.....	8.6
1945, 10-28 to 11-13	30	0	7.4	2.22	0.0	7.1	1,480	3,240	540	4	.001	1.0 D	6.2
1945, 12- 4 to 12-19	30	0	5.9	1.77	.0	7.4	1,220	2,840	380	2	.002	2.6 D	6.4
1945, 12-29 to 2- 3	0	0	2.2	.00	.0	6.3	500	2,040	3	27	.014	1.6 I	7.1
1946, 2-12 to 3-10	20	0	5.5	1.10	.0	6.6	540	2,030	0	8	.011	.9 D	7.1
1946, 3-11 to 3-20	0	0	4.9	.00	.0	6.3	550	970	0	5	.015	2.0 I	7.0
1946, 4- 5 to 4-16	0	0	13.8	.00	.0	6.4	560	2,280	0	17	.018	1.3 I	5.6
1946, 4-17 to 5- 1	10	0	14.5	1.45	.0	7.0*	1,510*	1,900	0	10*	.013*	1.3 D	5.8
1946, 5- 2 to 5-20	10	1.7	12.0	1.20	.20	7.4*	1,910*	3,050	22	3	.002	1.9 D	5.3
1946, 5-21 to 6- 2	10	3	19.0	1.90	57	7.4	1,940	4,160	840	1	.001	2.9 D	3.9
1946, 6- 4 to 6-11	5	6	22.6	1.13	1.35	7.5	1,740	4,800	6	8	.002	.2 I	3.3
1946, 6-12 to 6-22	5	9	19.9	1.00	1.79	7.7	3,400	5,720*	4	7	.003	1.6 I	4.0
1946, 6-23 to 7- 2	5	12	19.7	.98	2.36	7.9	5,460	7,930*	11	3	.002	.1 D	3.9
1946, 7- 3 to 7-18	5	18	22.8	1.14	4.10	7.9	9,790	10,640	7	1	.003	1.1 D	3.6
1946, 7-19 to 7-25	5	9	24.2	1.22	2.19	7.9	7,150	8,210	7	1	.002	.0	3.6
1946, 7-26 to 8- 8	7	9	22.1	1.54	1.99	7.7	4,830	6,650	170	1	.001	1.0 I	3.8
1946, 8- 9 to 8-17	7	12	21.5	1.50	2.57	7.6	5,830	8,560	220	1	.000	3.1 D	3.7
1946, 8-18 to 8-22	7	9	21.7	1.52	1.95	7.6	6,140	7,810	250	1	.001	.7 D	3.6
1946, 8-23 to 9- 4	2	9	19.5	.39	1.75	7.6	4,490	6,320	1*	1	.004	.6 D	3.6
1946, 9- 5 to 10-23	2	0	15.9	.32	.00	7.2	1,050	1,450	0	6*	.063*	.5 I*	4.7
1946, 10-26 to 11-13	7	9	26.0	1.82	2.34	7.5	5,280	5,500	780*	0*	.000*	1.0 D	4.8
1946, 11-15 to 12- 6	5	0	36.0	1.80	.0	7.2	3,950	3,470	170	0	.000	.0	4.8
1946, 12- 8 to 12-17	3.5	0	40.3	1.41	.0	6.9	1,190	2,350	72	2	.002	.2 D	4.6
1946, 12-18 to 12-21	3.5	0	64.9	2.28	.0	6.8	1,150	2,080	380	0	.....	.5 D	4.6
TESTS WITH SODIUM DICHROMATE, $Na_2Cr_2O_7 \cdot 2H_2O$													
1947, 1-15 to 1-24	4.3	0	25.4	1.09	0.0	6.4	410	920	0*	8	0.013	0.1 D	5.1
1947, 1-25 to 2-11	6.8	0	23.9	1.63	.0	6.2	580	1,440	70*	1*	.005	1.0 D	4.7
1947, 2-13 to 3- 7	10.0	0	27.9	2.79	.0	6.4	470	1,970	730	0	.002	1.0 D	4.0
1947, 3- 9 to 3-29	4.7	0	44.4	2.09	.0	6.7	570	1,610	58	0	.002	.4 D	3.6
1947, 4- 5 to 4-19	3.1	0	86.2	2.67	.0	6.5	370	1,230	230*	0	.003	.9 D	3.1
TEST WITH CHROMIC ACID, CrO_3													
1947, 4-24 to 5-10	3.0	0	55.1	1.65	0.0	5.1*	1,360	540	13	4*	0.005	.4 D	2.9
TESTS WITH SODIUM CHROMATE AND SODIUM HYDROXIDE													
1947, 5-11 to 5-26	3.0	4.0	48.8	1.46	1.95	7.5*	2,660	3,620	370	0	0.005	.6 D	2.6
1947, 5-28 to 6-11	0	5.0	39.6	.00	1.98	7.4	3,420	3,530	0	2	.004	1.3 I	3.1
1947, 7-31 to 8- 4	0	0	0	.00	.0	6.2	30	280	0	46	.....	.....	6.6

* In these instances only the data for the last half of the test period were used in estimating the values that would obtain if the period were extended indefinitely.
D Decrease in conductivity of tubing.
I Increase in conductivity of tubing.



11 Reasons why GOT-OLSCO is your best buy in Gas Lift

Pressure-charged gas lift valves have proved to be the most efficient and economical method of secondary recovery in the vast majority of wells.

Of the various pressure-charged gas lift valves now available, only the GOT-OLSCO Type "O" and its two variations—Type "O-BP" and "O-CF"—offer *all* of the outstanding advantages listed below.

When you buy gas lift valves, make sure they have all of these features:

1. **Full Bellows Protection.** High gas injection pressure or hydrostatic pressure cannot damage bellows.
2. **Fully Pressure Operated.** No springs to cause throttling and erratic action. The "O" Valve has a snap action on opening and closing.
3. **Surface Controlled.** Permits complete freedom in selection of most economical working level.
4. **Clean, Simple Design.** The "O" Valve has only two moving parts.
5. **Corrosion Resistant.** Constructed entirely of Monel metal, with exception of O-Rings and gaskets.
6. **Leak-Proof Sealing.** O-Rings and soft gaskets assure pressure-tight seals and simplify repair service.
7. **Grease Packed.** Heavy grease packing around bellows permits running inside mud filled casing without affecting valve operation.
8. **Full Convertibility.** Parts of the three types of "O" Valves are completely interchangeable, permitting easy conversion from one type to another.
9. **Easily Serviced in Field.** All parts can be easily serviced in the field, including re-pressuring of bellows.
10. **Protected Against Sand.** Efficient check valve permits lifting sand-laden fluids without damage.
11. **Backed by the largest gas lift organization in the world,** GOT-OLSCO Gas Lift Valves will produce any type of well more efficiently and more economically than any other method of artificial lift.

Full information on GOT-OLSCO Gas Lift Equipment may be obtained from your GOT-OLSCO representative or from our Houston office.

DISTRIBUTOR:
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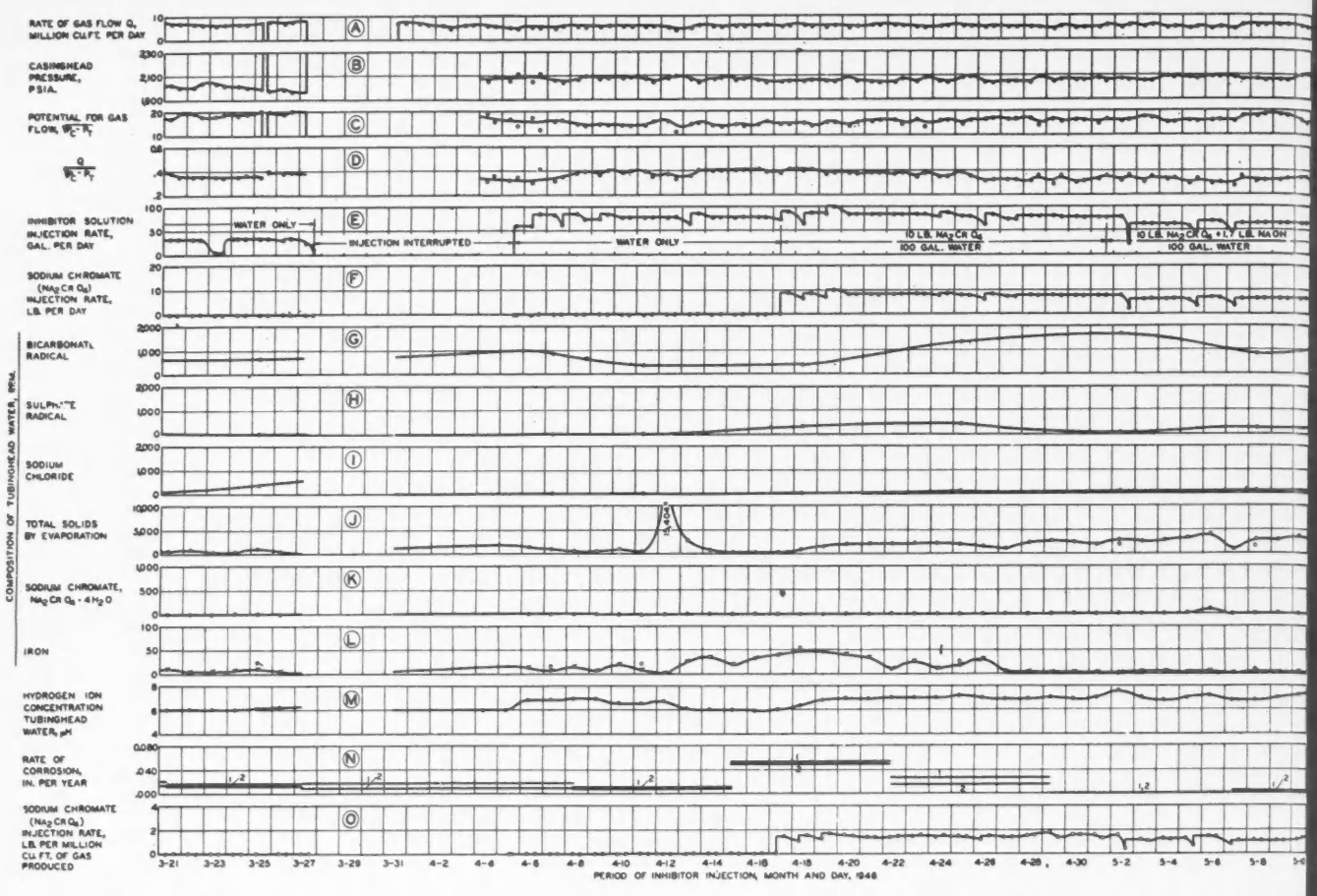
RATE OF GAS FLOW Q, MILLION CU.FT. PER DAY
CASINGHEAD PRESSURE, PSIA.
POTENTIAL FOR GAS FLOW, $\frac{Q}{\sqrt{P_c^2 - P_t^2}}$
INHIBITOR SOLUTION INJECTION RATE, GAL. PER DAY
WATER ONLY
INJECTION INTERRUPTED
WATER ONLY
10 LB. Na_2CrO_4 100 GAL. WATER
10 LB. Na_2CrO_4 + 1.7 LB. NaOH 100 GAL. WATER
SODIUM CHROMATE (Na_2CrO_4) INJECTION RATE, LB. PER DAY
COMPOSITION OF TUBINGHEAD WATER, P.P.M.
BICARBONATE RADICAL
SULPHATE RADICAL
SODIUM CHLORIDE
TOTAL SOLIDS BY EVAPORATION
SODIUM CHROMATE, $Na_2CrO_4 \cdot 4H_2O$
IRON
HYDROGEN ION CONCENTRATION TUBINGHEAD WATER, pH
RATE OF CORROSION, IN. PER YEAR
SODIUM CHROMATE (Na_2CrO_4) INJECTION RATE, LB. PER MILLION CU.FT. OF GAS PRODUCED
PERIOD OF INHIBITOR INJECTION, MONTH AND DAY, 1946

FIGURE 9. Results obtained by the injection of sodium chromate solutions into the flow stream of a gas-condensate well subject to corrosion March 31-May 10, 1946.

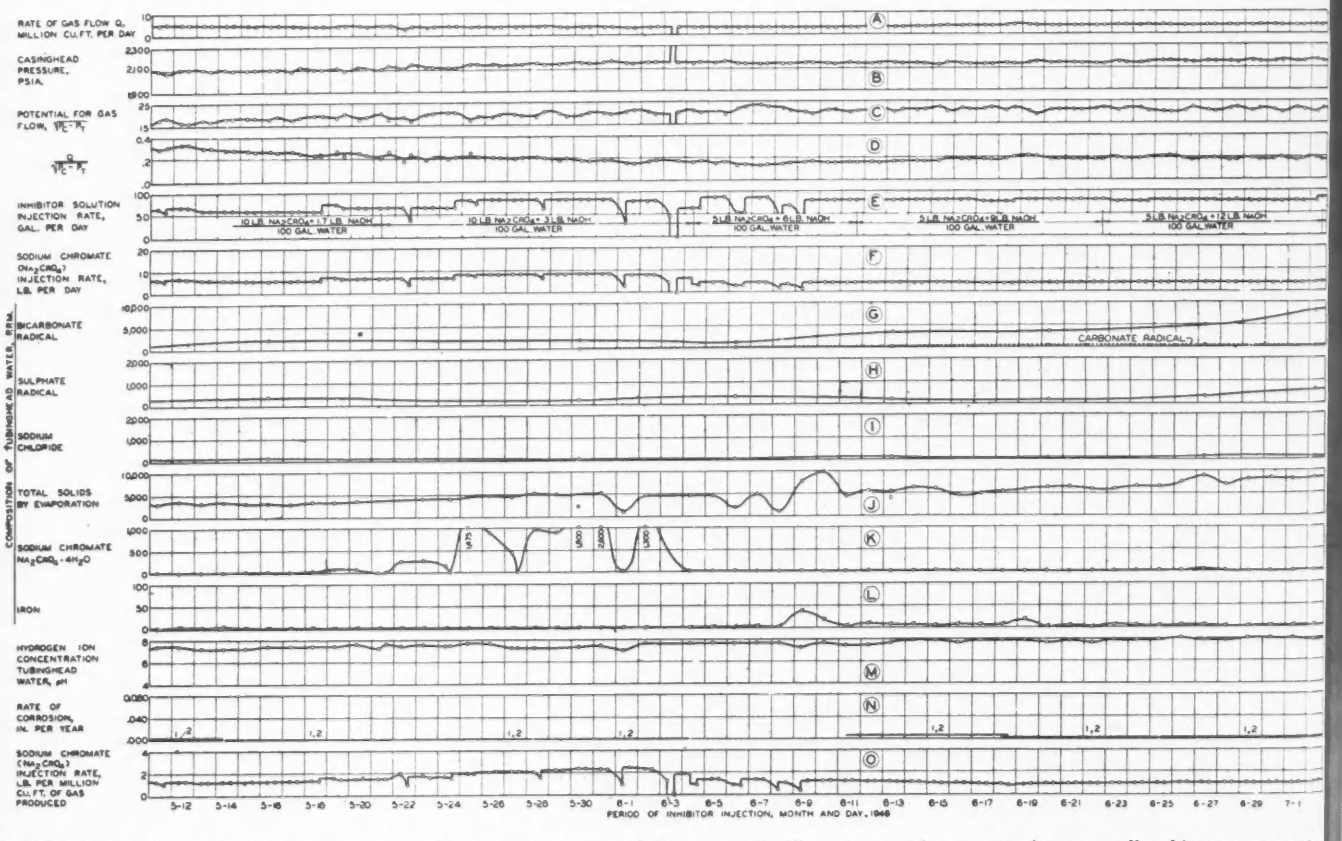
RATE OF GAS FLOW Q, MILLION CU.FT. PER DAY
CASINGHEAD PRESSURE, PSIA.
POTENTIAL FOR GAS FLOW, $\frac{Q}{\sqrt{P_c^2 - P_t^2}}$
INHIBITOR SOLUTION INJECTION RATE, GAL. PER DAY
10 LB. Na_2CrO_4 + 1.7 LB. NaOH 100 GAL. WATER
10 LB. Na_2CrO_4 + 3 LB. NaOH 100 GAL. WATER
5 LB. Na_2CrO_4 + 6 LB. NaOH 100 GAL. WATER
5 LB. Na_2CrO_4 + 9 LB. NaOH 100 GAL. WATER
5 LB. Na_2CrO_4 + 12 LB. NaOH 100 GAL. WATER
SODIUM CHROMATE (Na_2CrO_4) INJECTION RATE, LB. PER DAY
COMPOSITION OF TUBINGHEAD WATER, P.P.M.
BICARBONATE RADICAL
CARBONATE RADICAL(?)
SULPHATE RADICAL
SODIUM CHLORIDE
TOTAL SOLIDS BY EVAPORATION
SODIUM CHROMATE $Na_2CrO_4 \cdot 4H_2O$
IRON
HYDROGEN ION CONCENTRATION TUBINGHEAD WATER, pH
RATE OF CORROSION, IN. PER YEAR
SODIUM CHROMATE (Na_2CrO_4) INJECTION RATE, LB. PER MILLION CU.FT. OF GAS PRODUCED
PERIOD OF INHIBITOR INJECTION, MONTH AND DAY, 1946

FIGURE 10. Results obtained by the injection of sodium chromate solutions into the flow stream of a gas-condensate well subject to corrosion May 12-July 1, 1946.

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Ask any user . . . you'll find them everywhere

Scores of industries, users of Wickwire Rope have developed an affectionate respect for its performance, safety and long life. And, for true economy, they use Wickwire's WISSCOLAY® preformed. It lasts longer—is easier to cut, splice and install. It's kink-resistant and easier to handle. Wickwire Distributors and Rope Engineers, in key cities everywhere, are prepared to render prompt service in meeting your wire rope needs. Wickwire Rope Sales Office and Plant—Palmer, Mass.

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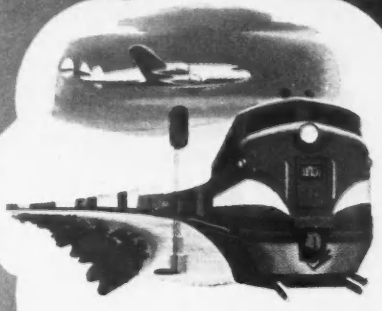
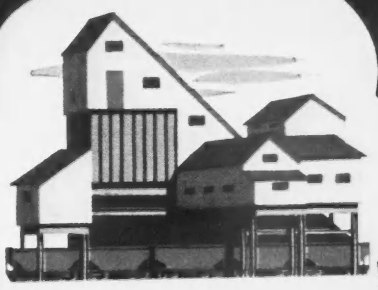
Continental Oil Bldg., Denver, Colo.
ON THE WEST COAST—The California Wire Cloth Corp.
1880—19th Ave., Oakland 6, Cal.

LOGGING

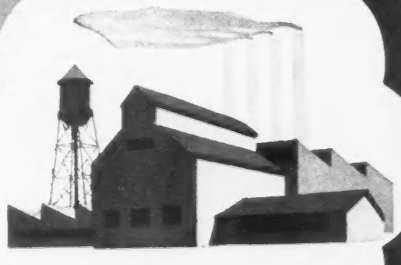


TRANSPORTATION

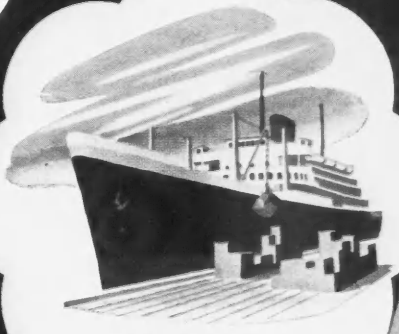


MINING

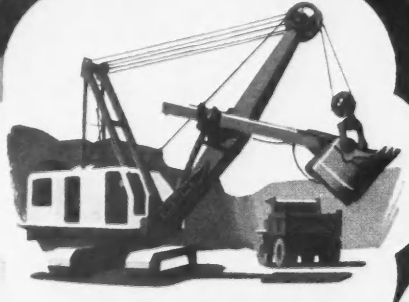
PETROLEUM



MANUFACTURING



MARINE

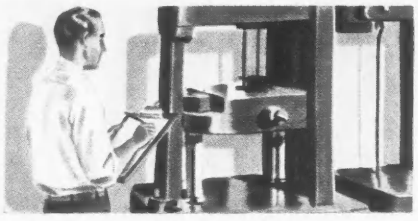


CONSTRUCTION

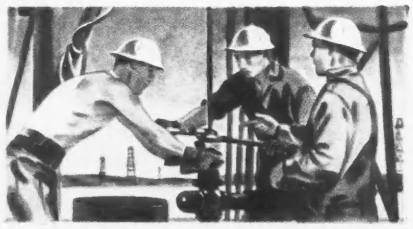
A. E. Brotman

AXELSON FIRST CHOICE

ROD CREW FOREMEN AGREE there is no better sucker rod than an AXELSON, because 55 years of manufacturing "know how" and the reputation of the industry's pioneer producer of sucker rods is behind every stand they make up.



GUARANTEED *MINIMUM* PHYSICAL PROPERTIES give foremen and crew confidence in an AXELSON rod string . . . make it unnecessary to allow for unknown "low limits" . . . descaling after heat-treatment assures absence of hidden surface defects where corrosion can start.



LESS FREQUENT PULLING AND FISHING when AXELSON rods link the plunger to the beam . . . controlled quality sucker rod steels . . . precision machined threads and couplings assure perfect alignment of rod body with pin end . . . scientific heat-treatment gives uniform grain structure and greater strength from end-to-end.

AXELSON FIRST CHOICE *in Deep Well Plunger Pumps, Pump Components, Sucker Rods and Hydraulic Long Stroke Pumping Units*

EASIER TO MAKE UP AND PRELOAD through more care in manufacturing . . . threading after heat-treatment prevents thread distortion . . . accurately machined face of rod shoulder and ground ends on heat-treated couplings, mate and preload perfectly.

IMMEDIATE AVAILABILITY IN ALL FIE cuts down-time waiting for rods . . . a and type of rod and coupling for e pumping load and well condition . . . plete stocks at the "well-side" in most fi ready for immediate delivery.

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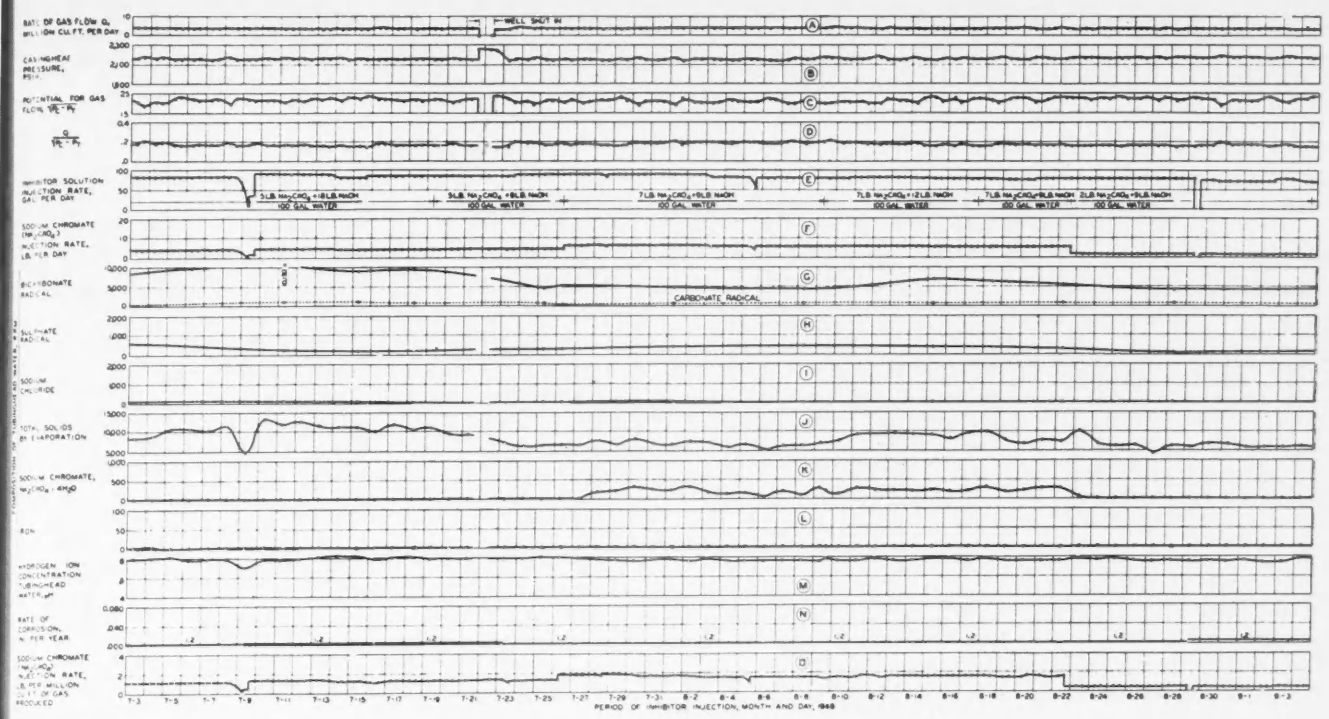

FIGURE 11. Results obtained by the injection of sodium chromate solutions into the flow stream of a gas-condensate well subject to corrosion, July 3-September 3, 1946.

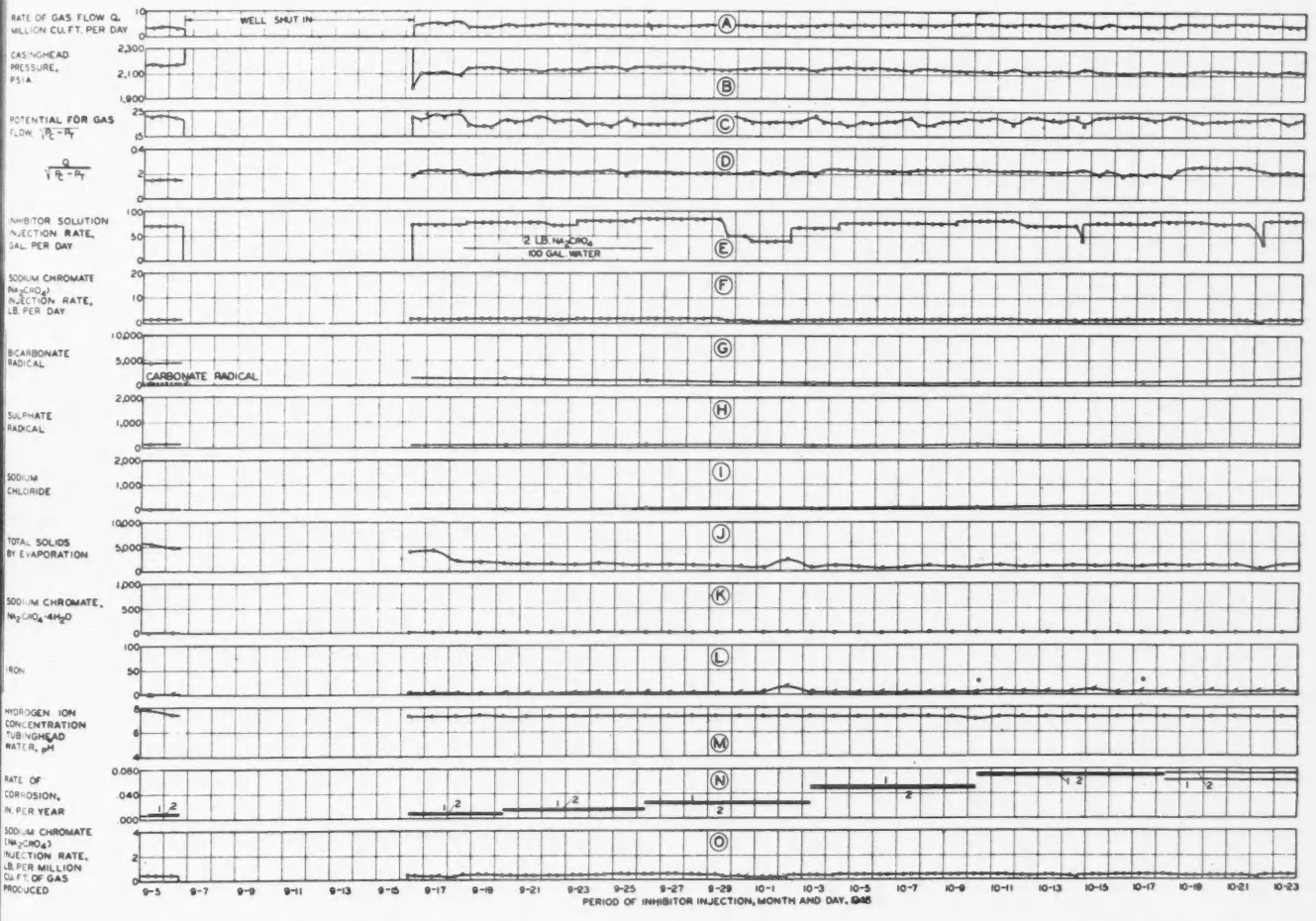
RATE OF GAS FLOW Q, MILLION CU.FT. PER DAY
WELL SHUT IN
CASINGHEAD PRESSURE, PSIA
POTENTIAL FOR GAS FLOW $\frac{Q}{\sqrt{P_c - P_f}}$
INHIBITOR SOLUTION INJECTION RATE, GAL. PER DAY
2 LB. Na_2CrO_4 100 GAL. WATER
SODIUM CHROMATE (Na_2CrO_4) INJECTION RATE, LB. PER DAY
BICARBONATE RADICAL
CARBONATE RADICAL
SULPHATE RADICAL
SODIUM CHLORIDE
TOTAL SOLIDS BY EVAPORATION
SODIUM CHROMATE, $Na_2CrO_4 \cdot 4H_2O$
IRON
HYDROGEN ION CONCENTRATION TUBINGHEAD WATER, pH
RATE OF CORROSION, IN. PER YEAR
SODIUM CHROMATE (Na_2CrO_4) INJECTION RATE, LB. PER MILLION CU. FT. OF GAS PRODUCED
PERIOD OF INHIBITOR INJECTION, MONTH AND DAY, 1946

FIGURE 12. Results obtained by the injection of sodium chromate solutions into the flow stream of a gas-condensate well subject to corrosion, September 5-October 23, 1946.

rial in the solution that was introduced into the tubing each day. In Section O, the rate at which treating material was used is referred to the quantity of gas flowing simultaneously through the tubing.

Effectiveness of Corrosion Control

Analyses of daily samples of effluent water (water withdrawn from a trap at the tubinghead) provided information that was important in determining the results being obtained by different tre ments. Analytical data obtained plotted in Sections G through M inc sive. To supplement and check the da water analyses made in the field, a sa ple of water was collected from

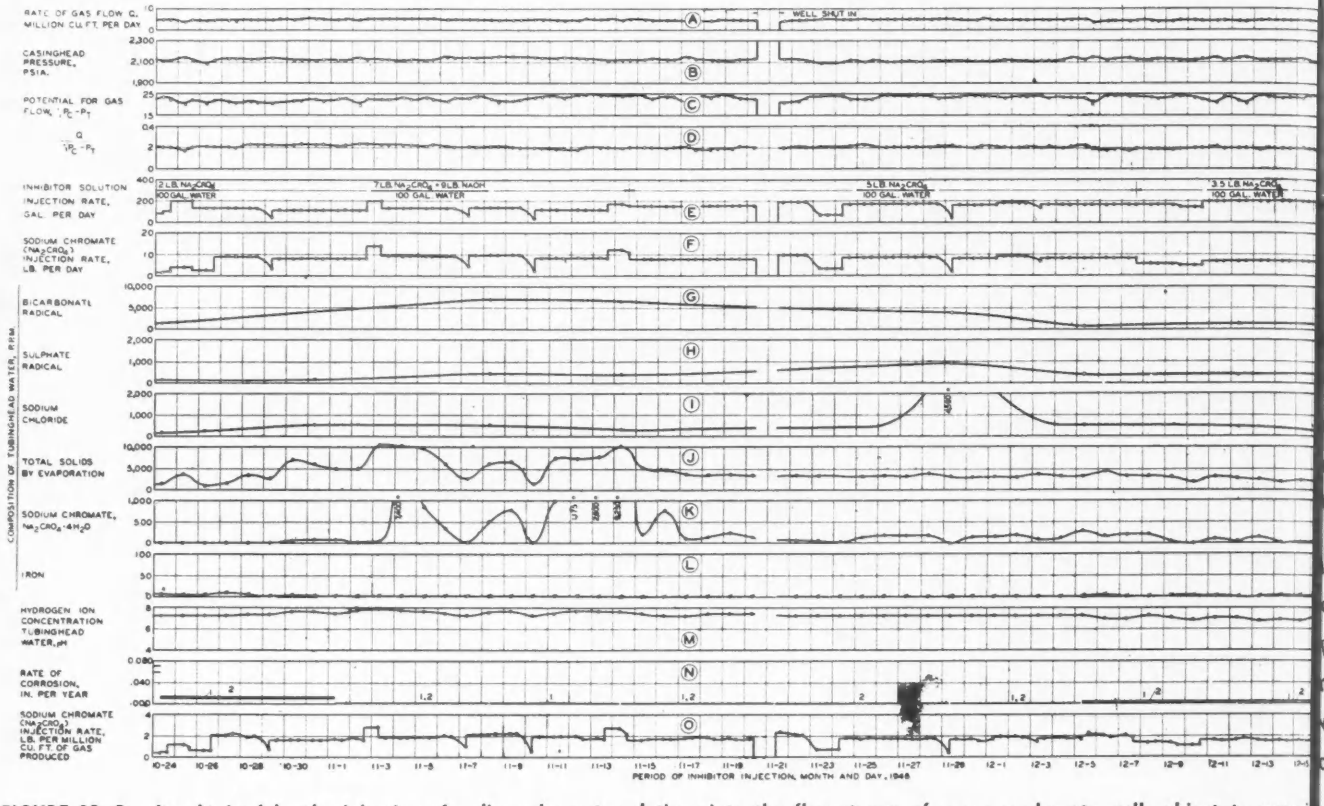
RATE OF GAS FLOW Q, MILLION CU.FT. PER DAY
WELL SHUT IN
CASINGHEAD PRESSURE, PSIA.
POTENTIAL FOR GAS FLOW, $\frac{Q}{\sqrt{P_c^2 - P_t^2}}$
INHIBITOR SOLUTION INJECTION RATE, GAL. PER DAY
2 LB. Na_2CrO_4 100 GAL. WATER
7 LB. Na_2CrO_4 + 9 LB. NAOH 100 GAL. WATER
5 LB. Na_2CrO_4 100 GAL. WATER
3.5 LB. Na_2CrO_4 100 GAL. WATER
SODIUM CHROMATE (Na_2CrO_4) INJECTION RATE, LB. PER DAY
COMPOSITION OF TUBINGHEAD WATER, P.P.M.
BICARBONATE RADICAL
SULPHATE RADICAL
SODIUM CHLORIDE
TOTAL SOLIDS BY EVAPORATION
SODIUM CHROMATE, $Na_2CrO_4 \cdot 4H_2O$
IRON
HYDROGEN ION CONCENTRATION TUBINGHEAD WATER, pH
RATE OF CORROSION, IN. PER YEAR
SODIUM CHROMATE (Na_2CrO_4) INJECTION RATE, LB. PER MILLION CU. FT. OF GAS PRODUCED
PERIOD OF INHIBITOR INJECTION, MONTH AND DAY, 1946

FIGURE 13. Results obtained by the injection of sodium chromate solutions into the flow stream of a gas-condensate well subject to corrosi October 24-December 15, 1946.

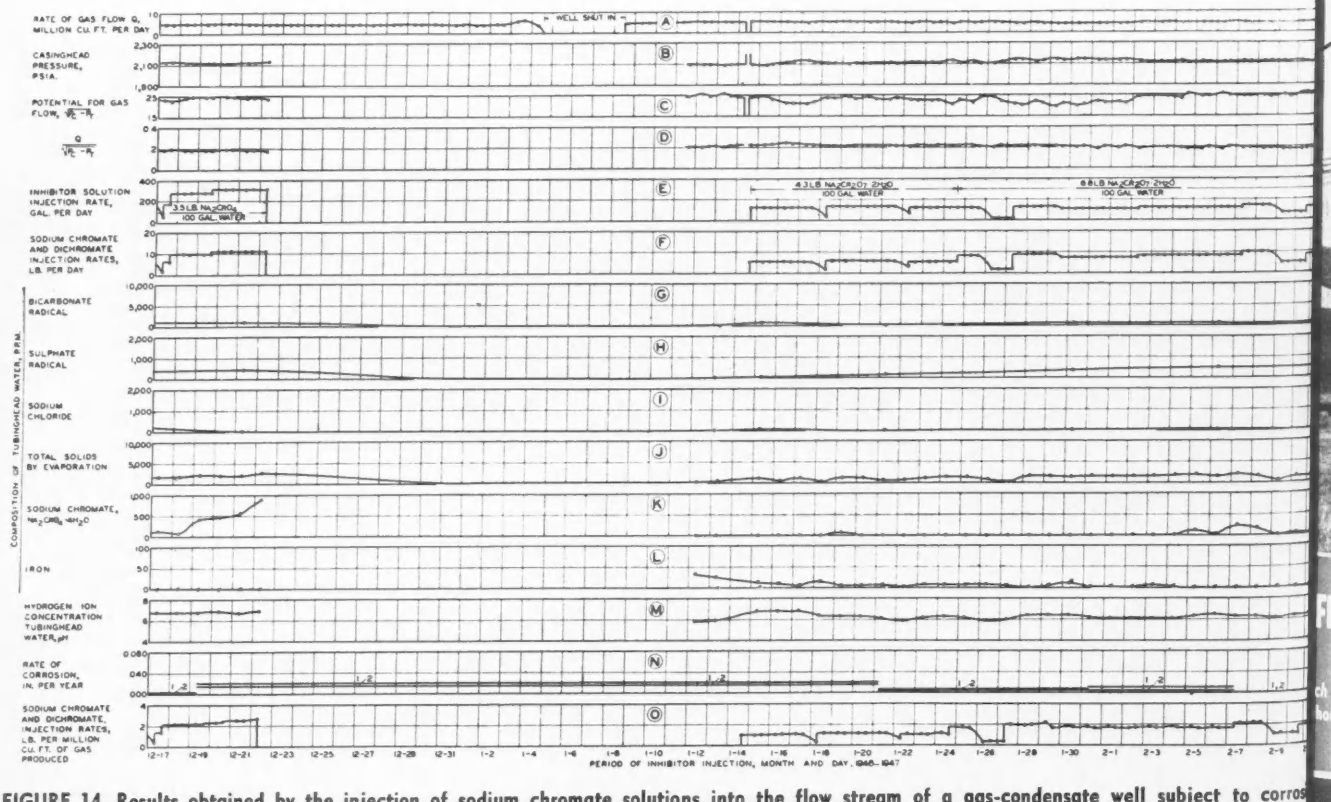
RATE OF GAS FLOW Q, MILLION CU.FT. PER DAY
WELL SHUT IN
CASINGHEAD PRESSURE, PSIA.
POTENTIAL FOR GAS FLOW, $\frac{Q}{\sqrt{P_c^2 - P_t^2}}$
INHIBITOR SOLUTION INJECTION RATE, GAL. PER DAY
3.5 LB. Na_2CrO_4 100 GAL. WATER
4.3 LB. $Na_2Cr_2O_7 \cdot 2H_2O$ 100 GAL. WATER
6.8 LB. $Na_2Cr_2O_7 \cdot 2H_2O$ 100 GAL. WATER
SODIUM CHROMATE AND DICHROMATE INJECTION RATES, LB. PER DAY
COMPOSITION OF TUBINGHEAD WATER, P.P.M.
BICARBONATE RADICAL
SULPHATE RADICAL
SODIUM CHLORIDE
TOTAL SOLIDS BY EVAPORATION
SODIUM CHROMATE, $Na_2CrO_4 \cdot 4H_2O$
IRON
HYDROGEN ION CONCENTRATION TUBINGHEAD WATER, pH
RATE OF CORROSION, IN. PER YEAR
SODIUM CHROMATE AND DICHROMATE, INJECTION RATES, LB. PER MILLION CU. FT. OF GAS PRODUCED
PERIOD OF INHIBITOR INJECTION, MONTH AND DAY, 1946-1947

FIGURE 14. Results obtained by the injection of sodium chromate solutions into the flow stream of a gas-condensate well subject to corros December 17, 1946-February 11, 1947.

THEY REPLACE EVERY TIME WITH THE Lufkin Line

Typical is this picture of the replacement of an old "Standard" rig with a modern, efficient, economical LUFKIN PUMPING UNIT.

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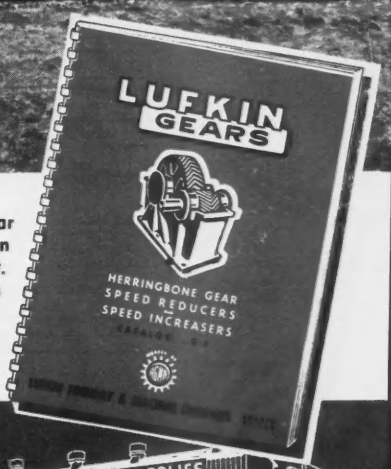
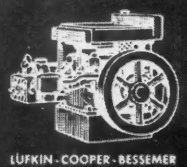
More than 60,000 complete gear reducers and increasers have been manufactured in our Lufkin plant. The complete line specifications are contained in Catalog G-1. Write for your copy today. No obligation whatsoever!



LUFKIN PUMPING UNITS



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INDUSTRIAL SPEED REDUCERS AND INCREASERS

DIVISION LUFKIN FOUNDRY & MACHINE COMPANY INDUSTRIAL, MILL AND AUTOMOTIVE SUPPLIES

tubinghead trap each week and analyzed in the Bureau of Mines laboratory at Bartlesville, Okla. The concentration of iron in the water was determined in the field by a colorimetric method (4, method 5) and in the laboratory by a gravimetric method.[29] The analytical data plotted in Section L show that the results obtained by the two methods generally were in good agreement.

Before a sample of water was withdrawn from the tubinghead trap, the trap was blown free of all accumulated water and sediment; after it had filled again with water from the flowstream, the water sample was taken. The sample was collected in a glass container under atmospheric pressure. A portion of the sample was filtered immediately for the pH determination reported in Section M. For determining the total solids by evaporation as given in Section J, the contents of the sample container were

■ CONTINUED ON PAGE 1

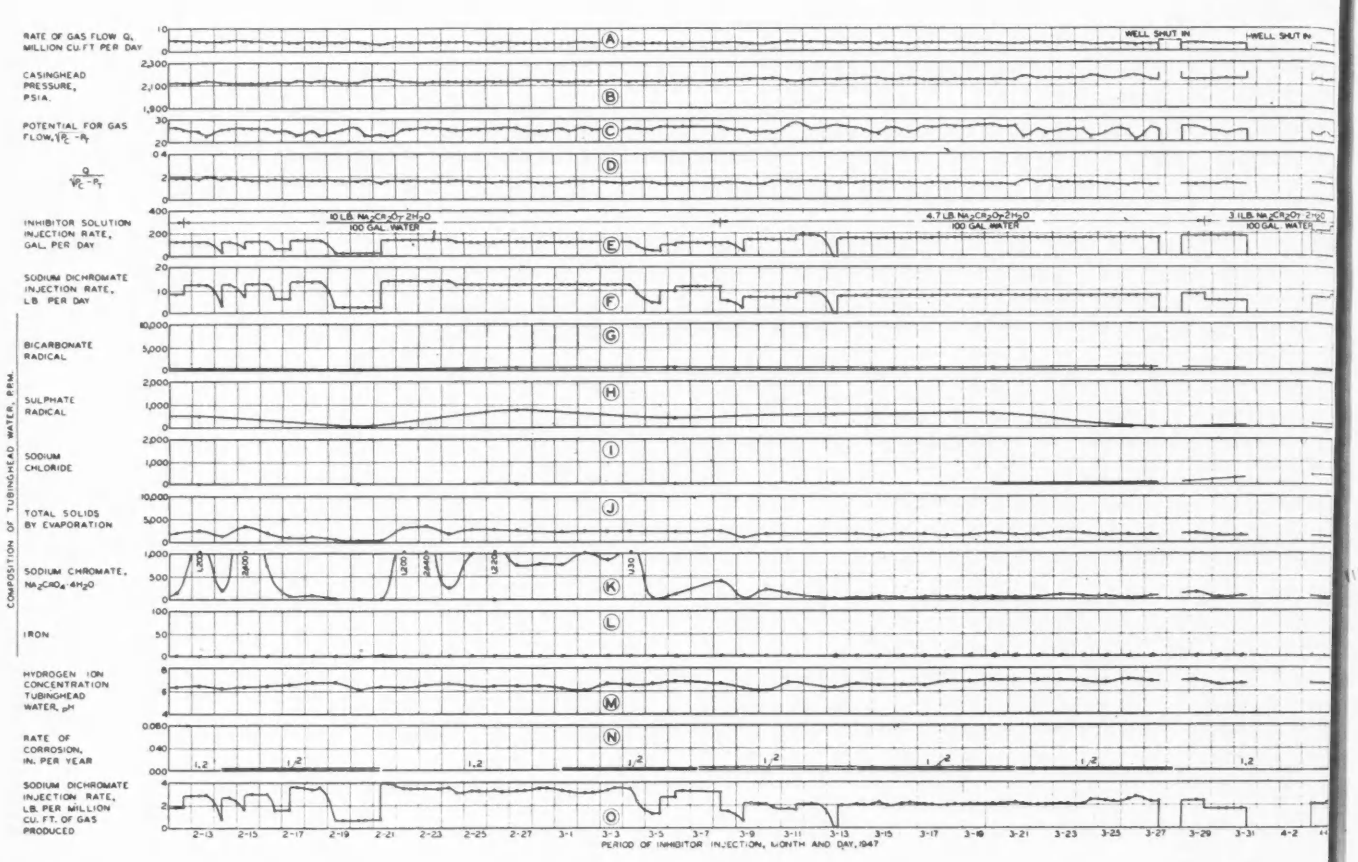

RATE OF GAS FLOW Q, MILLION CU.FT PER DAY
CASINGHEAD PRESSURE, PSIA.
POTENTIAL FOR GAS FLOW, $\sqrt{P_c - P_f}$
$\frac{Q}{\sqrt{P_c - P_f}}$
INHIBITOR SOLUTION INJECTION RATE, GAL. PER DAY
10 LB. $Na_2Cr_2O_7 \cdot 2H_2O$ 100 GAL. WATER
4.7 LB. $Na_2Cr_2O_7 \cdot 2H_2O$ 100 GAL. WATER
3 LB. $Na_2Cr_2O_7 \cdot 2H_2O$ 100 GAL. WATER
SODIUM DICHROMATE INJECTION RATE, LB. PER DAY
BICARBONATE RADICAL
SULPHATE RADICAL
SODIUM CHLORIDE
TOTAL SOLIDS BY EVAPORATION
SODIUM CHROMATE, $Na_2CrO_4 \cdot 4H_2O$
IRON
HYDROGEN ION CONCENTRATION TUBINGHEAD WATER, pH
RATE OF CORROSION, IN. PER YEAR
SODIUM DICHROMATE INJECTION RATE, LB. PER MILLION CU. FT. OF GAS PRODUCED
COMPOSITION OF TUBINGHEAD WATER, P.P.M.
WELL SHUT IN
PERIOD OF INHIBITOR INJECTION, MONTH AND DAY, 1947

FIGURE 15. Results obtained by the injection of sodium chromate solutions into the flow stream of a gas-condensate well subject to corrosion February 13-April 4, 1947.

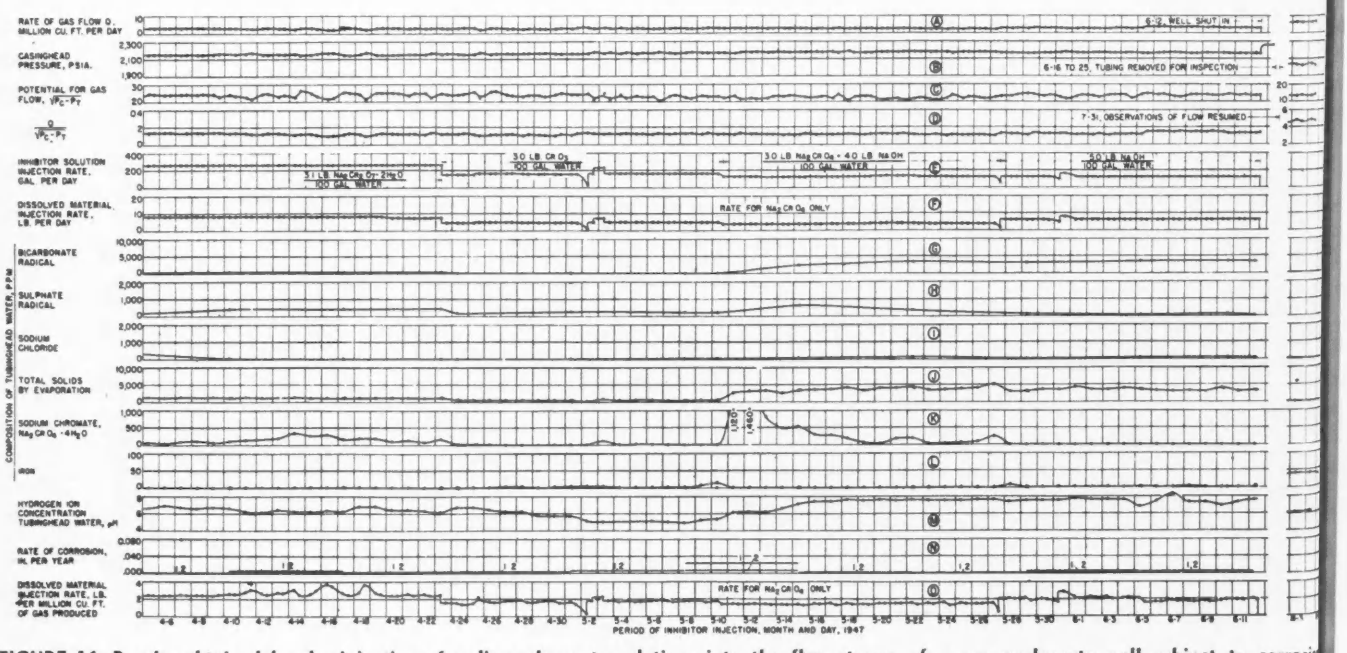
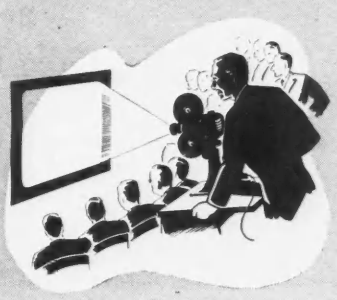

RATE OF GAS FLOW Q, MILLION CU. FT. PER DAY
CASINGHEAD PRESSURE, PSIA.
POTENTIAL FOR GAS FLOW, $\sqrt{P_c - P_f}$
$\frac{Q}{\sqrt{P_c - P_f}}$
INHIBITOR SOLUTION INJECTION RATE, GAL. PER DAY
DISSOLVED MATERIAL INJECTION RATE, LB. PER DAY
BICARBONATE RADICAL
SULPHATE RADICAL
SODIUM CHLORIDE
TOTAL SOLIDS BY EVAPORATION
SODIUM CHROMATE, $Na_2CrO_4 \cdot 4H_2O$
IRON
HYDROGEN ION CONCENTRATION TUBINGHEAD WATER, pH
RATE OF CORROSION, IN. PER YEAR
DISSOLVED MATERIAL INJECTION RATE, LB. PER MILLION CU. FT. OF GAS PRODUCED
COMPOSITION OF TUBINGHEAD WATER, P.P.M.
6-2, WELL SHUT IN
6-16 TO 25, TUBING REMOVED FOR INSPECTION
7-31, OBSERVATIONS OF FLOW RESUMED
30 LB CrO_3 100 GAL. WATER
30 LB Na_2CrO_4 + 4.0 LB NaOH 100 GAL. WATER
4.0 LB NaOH 100 GAL. WATER
RATE FOR Na_2CrO_4 ONLY
PERIOD OF INHIBITOR INJECTION, MONTH AND DAY, 1947

FIGURE 16. Results obtained by the injection of sodium chromate solutions into the flow stream of a gas-condensate well subject to corrosion April 6-June 11, and August 3-August 5, 1947.

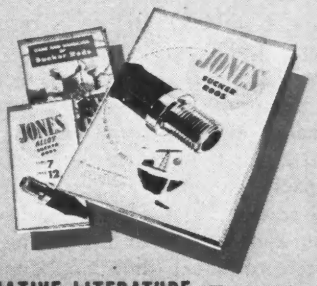
3 WAYS

Jones Helps Improve Sucker Rod Service



1

VISUAL INSTRUCTION. A new sound motion picture has proved a real time and money saver for instructing rod crews, supplier's men and others in correct care and handling of sucker rods. Group showings are arranged upon request.



2

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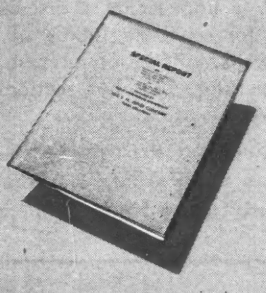

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Tubing Repair

In Water Input Wells

By J. W. FERRY and J. C. VAUGHN

Engineering Department, Quaker State Oil Refining Corporation

AN UNORTHODOX—but successful—method of self-plugging for holes which have corroded through tubing in water input wells is described. The method prolongs tubing life far beyond that expected were it necessary to pull the string for repair of a few, scattered perforations.

NO WATER flooding operation can hope to succeed unless the tubing through which input water is being injected is leak proof. One of the more common causes of leaks in tubing in water intake wells is corrosion. This has become a serious problem, especially in the old Bradford, Penna., area where the majority of water flooding operations have been in progress for many years. Many of the older leases have as high as 30 to 40 percent of the water wells "broke in" (holes in tubing) and as a result, have very few completely pressured five-spots. Until recently, the only solution to the problem consisted of running smaller tubing (three-fourths or one inch) inside the original tubing with a pony packer to effect a pressure seal. Running smaller tubing is an expensive operation and the life of the tubing is very often of short duration. Consequently, a quick, inexpensive method of repairing tubing leaks would be extremely beneficial. Since the problem is one that affects all water flood operators, and is not necessarily restricted to any one area, it is hoped that a discussion of methods for repairing tubing in water intake wells, will be of interest and utility to operators in other sections of the country.

The Engineering department of the Quaker State Oil Refining Corporation had previously learned that H. P. Benson of Bolivar, N. Y., was successfully plugging tubing leaks of water intake wells with some unknown type of material. Consequently, two engineers were assigned to the task of experimenting with various types of possible plugging material which might solve the all-important problem of tubing leaks.

The first experiments consisted of trying various plugging materials inbedded in a wad of bubble gum acting as a "carrier" or matrix. The section of tubing used contained previously drilled holes and was located above ground in order to observe the results. The plugging "agents" tried were semi-flexible plastic bits, pieces of rubber, and lead wool; the rubber being the most successful. When water (under 1200 pounds per square inch) was turned into the tubing with the drilled holes, the bubble gum carrier moved along with the water until the lower hole was encountered. Immediately, the bubble gum began to squeeze through the hole, carrying the rubber plug along and seating the piece of rubber in the hole. This plug automatically increased the pressure, which in turn, drove the rubber plug farther into the hole, thus effecting a pressure seal. The second hole was plugged in the same manner. There is little chance that the plugging material might by-pass the hole in the tubing because the plug automatically follows the water having the higher velocity. The velocity of the water passing through any hole of appreciable size would always be greater than that of the water going down the tubing because of the greater differential in pressure.

Following the successful experiments field tests were approved. Very early during field tests, it became apparent that materials other than bubble gum were far more successful. The bubble gum would do the job, but it did not possess the desirable adhesive qualities to say nothing of the tiring effect on jaw fatigue incurred by its preparation. Crude paraffin (commonly referred to as "basic sediment") proved to be quite effective in most cases, although the tensile strength was not at all times sufficient to enable the carrier to remain intact in its journey down the tubing. By far, the most useful material for a carrier was babbitt put (commercially known as "Damtite")

About the Authors

J. W. FERRY has engaged in various occupations in the oil industry including that as a member of the contracting firm of Ferry and Updegraff. He served in the Aviation section of the U. S. Signal Corps during World War I. He was employed by Quaker State Oil Refining Corporation's Pipe Line department from 1930 to 1940. He rejoined the U. S. Air Force in 1940 and served until 1946, when he was discharged with the rank of lieutenant colonel. Since 1946 he has been employed in Quaker State's Engineering department.

J. C. VAUGHN entered Ohio State University in 1941 but left in 1943 to enter the armed forces. He served three years in the U. S. and overseas and returned to the university in 1946, graduating the following year with the degree of B.E.M., majoring in petroleum engineering. He spent one quarter at O.S.U. in graduate work under a Shell Oil Company fellowship. Vaughn started work for Quaker State Oil Refining Corporation (Production department) as a petroleum engineer in 1948.

The authors, Ferry, left, and Vaughn, right, are placing the plug into the intake well tubing. Meter is between pressure line and tubing.

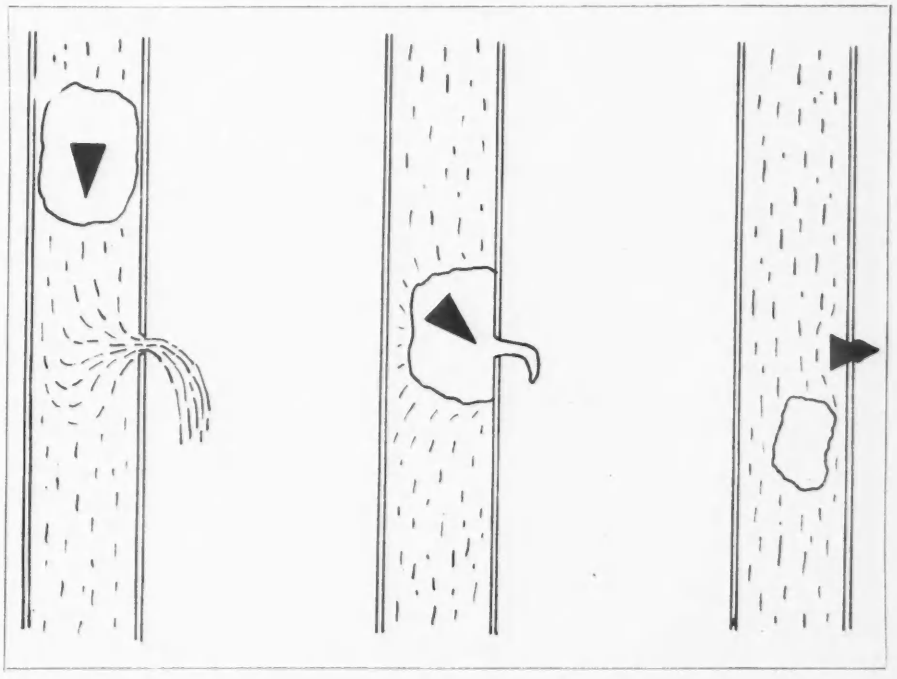
Photograph was taken immediately after tubing head was secured and water was turned on. Note gauge reading of 1000 psi after rubber plug hits.

s made up of a mixture of asbestos iber in a crude base and possesses very ood tensile and adhesive qualities.

After several water wells had been uccessfully plugged, it became evident hat the shapes and sizes of rubber lugs varied for individual wells. For he most part, the plugs were cut from ld packer rubbers. Medium soft rub- er usually produced the best results, lthough some wells did not respond until a softer or harder rubber was tried. n a few cases, where the hole was uite large, the ordinary plugs would old only until the pressure began to ncrease significantly. Then the plug would squeeze through. In these cases, harder rubber plug cut into a conical hape (from No. 3 or 4 rubber stopper) roved to be very successful. For most lugging operations, triangular or py- amidal shaped pieces of rubber gave he best results. The triangular pieces ere approximately twice as long as ide, and varied in thickness depend- ng upon the hole size. Rubber plugs ere frequently shaped to necessary pecifications when the first ones tried ailed to plug the hole. For the aver- ge hole, pieces of rubber approximately ne inch long with a base one-half inch ross and tapered to a joint, gave good esults.

Speed Operation

When a well was to be plugged, the alve was opened up to fill the tubing ith water. Where the tubing could not filled, the only alternative remaining was to speed up the plugging operation so that the water level in the tubing remained above the hole until full pressure was turned on. After the tubing was full (or, as near as possible), the valve was closed and the top of the tubing was opened up. Then a "plug" (rubber bits mixed into the babbitt putty carrier) with its diameter slightly less than that of the tubing, was placed into the tubing. The plug was pushed down into the tubing far enough to be below the incoming water. The top of the tubing was quickly replaced and the valve immediately opened. It is desirable to have a valve on the tubing head in order to mount a pressure gauge. By watching the pressure gauge, every



LEFT. Cross-section showing movement of carrier, with rubber plug inside, down the tubing toward the hole.

CENTER. Carrier stops at the hole and begins to squeeze through.

RIGHT. Rubber plug becomes seated in the hole and remainder of carrier goes down the tubing.

movement of the plug can be detected. Several pressure surges might be noticed before the hole is reached by the plug. These surges are evidently due to carbonate deposits or badly corroded sections within the tubing. When the hole is encountered and the rubber plug "hits," a sharp surge in pressure usually results. The amount of pressure increase is dependent upon the line pressure (in pounds per square inch gauge) and the velocity of the water in the tubing. When it is impossible to use a pressure gauge, the sudden vibration of the tubing will indicate a hit. A meter can be used to determine the decrease in water input, but it is not necessary.

When shallow tubing holes are encountered, it is often desirable to mix enough ground cork bits in with the carrier to make the plug float. This prevents the plug from dropping below the water level while the connections are made. Occasionally, a plug will hit and quickly move on; consequently, it is a good policy to close and re-open the valve several times before trying a second plug. This procedure allows the plug to come back up to the hole again and possibly, to seat the plug more firmly. When a string of tubing has several holes, the holes can usually be plugged one at a time.

Field Test Results

The results of the field tests have been remarkably good. To date, the authors have successfully plugged 54 wells out of 64 attempts. Some of the wells had several holes and among the ten unsuccessful wells were several which might well have been plugged if more time had been given them. Some wells required a second or third plugging operation but very often the wells had developed new holes. Tubing splits or thread leaks do not respond well to the present plugging procedures.

The experimental phase of this type of repair is past and work is being carried on by the production department using the information given above. Undoubtedly, some other ideas will be developed. Certainly some strings of tubing are not possible to repair; thread leaks and splits are a long chance, but the over-all score is good.

ACKNOWLEDGMENT

The authors wish to thank E. T. Heck for his interest and support in the experiments; J. K. Barton, associate engineer of the Quaker State Oil Refining Corporation for making the time available, for suggestion on materials and for advice in the construction of test apparatus; and H. P. Benson of Bolivar, N. Y., for the initial idea that such an unorthodox method of reclaiming pressure intake wells would work. The assistance and cooperation of the Production department in conducting the field tests is gratefully acknowledged. Acknowledgment is due J. P. Healy of the Quaker State Oil Refining Corporation for permission to publish this paper.

Sodium Chromates and Alkalies

■ CONTINUED FROM PAGE 164

agitated thoroughly so that the volume of liquid withdrawn for the evaporation test would contain an apportioned part of the solids in temporary suspension.

The iron content of the water sample provided a measure of the rate at which corrosion was taking place in the tubing. Coupons of carbon steel exposed to the flowing fluid at two positions in the flow line downstream from the Christmas tree provided a means for measuring the corrosiveness of the fluid after it had traversed the tubing. Occasionally, a treatment involving the use of a limited quantity of chemical provided substantially complete corrosion control at the inlet end of the tubing and less effective control as most or all of the chemical was consumed on the way up the tubing with the flowing fluid. In such instances, the quantities of iron that accumulated in the water were small, and the rates of corrosion of coupons higher than when there was an excess of chromates in the effluent water. Measures of rates of corrosion by means of wellhead coupons are recorded in Section N, and they are believed to indicate reliably the completeness of corrosion control when chromates and alkalies were introduced into the flowstream at the tubing entrance.

pH of Flowing Water and Chromate Input Rate Are Important Control Factors

When washing the tubing of the test well with water was begun on March 11, 1946, the flow-capacity factor (function 15) was 0.32, and by April 17 the value had increased to 0.40, although the rate of withdrawal of gas from the wellhead had decreased slightly. During this period the iron content of the effluent water averaged 17 ppm, and rates of corrosion of wellhead coupons averaged 0.018 ipy.

At this point in the field tests, two important precautions seemed necessary to prevent obstruction of the tubing by deposits of hydrous chromic oxide formed during the treatments: (1) Injecting enough water so that the gas entering the tubing was saturated and liquid water in quantity was present to carry salts, dissolved or in suspension up the tubing; and (2) minimizing the reduction of water-soluble chromates to water-insoluble compounds of chromium of lower valence. The water-injecting pump available at the time was operating at capacity, so that there was no way to increase the volume of wa flowing with gas in the flowstre except by lowering the rate of gas fl As this was not desirable, the tests d ing the next several weeks were c cerned with the second of the two f tors and were planned to find means lowering the rate at which chroma were reduced in the flowstream.

Two Procedures

On the basis of experience gained the field and laboratory and theoreti considerations, two procedures were c sidered for minimizing the reduction chromates: (1) Maintaining the pH the water in the flowstream at hi values; and (2) maintaining the in of chromates at the lowest possible r that would provide corrosion cont The treatment beginning on April involving the injection of 1.45 pounds sodium chromate and 14.5 gallons water into the flowstream per milli cubic feet of gas, lowered rates of c rosion to negligible values within days but also caused a lowering in value of the tubing flow-capacity fact Beginning on May 1, the treatment w modified by including a small amount sodium hydroxide in the injected so tion to increase the pH of the efflu water. This solution contained 10 pou of sodium chromate and 1.7 pounds sodium hydroxide per 100 gallons. shown in Colum 7 of Table 7, the p was increased from 7.0 to 7.4 and ra of corrosion continued low (Columns and 12), but there still was a continu decrease in the flow capacity of the t ing. A treatment begun on May 21, wh three pounds instead of 1.7 pounds sodium hydroxide per 100 gallons the treating solution were used, did n increase the pH of the effluent wa appreciably. For this treatment the j jection rate was increased, and becau more solution was injected each day the pumps, a higher concentration sodium chromate (1.9 pounds) than previous tests flowed with each milli cubic feet of gas. As shown by Table sodium chromate in the effluent wa averaged 840 ppm, and the flow-capac factor for the tubing decreased at t rate of 2.9 percent per day. This last t did not provide much information co cerning the effect of increased alkali co centration on chromate conservation, b it did indicate the need for a reducti in the rate of sodium chromate injecti

REFERENCE

[29] Reistle, C. E. Jr., and Lane, E. C., A S tem of Analysis for Oil Field Waters, Bur of Mines Technical Paper 432, 14 pp.

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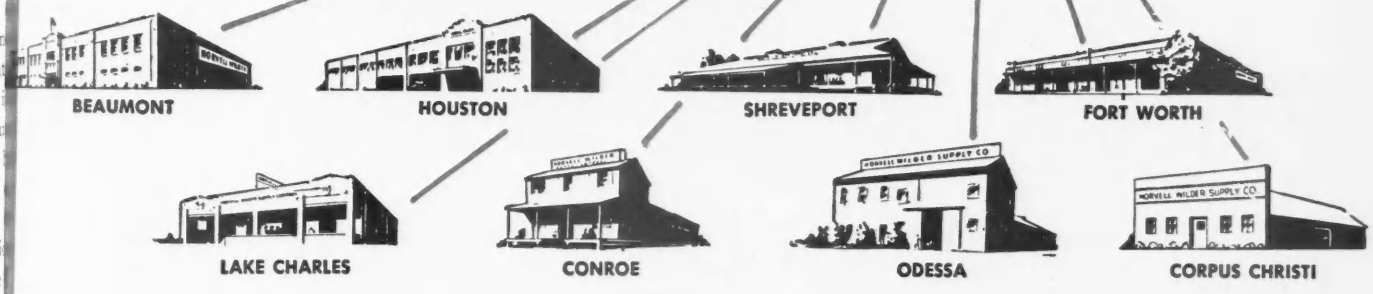

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Measuring Oil Reserves by Injected Gas

By FREDERICK SQUIRES

Petroleum Engineer, Illinois State Geological Survey

THE writer has applied to gas-injection operations on oil sands in Ohio, West Virginia, and Illinois the J. O. Lewis method of raising the over-all pressure on the stratum in order to force gas to traverse its less permeable as well as its more permeable portions. In doing this he has found that pressure may be built up and brought to equilibrium over an entire field in a short time if the sands are highly permeable and the pool of moderate size. These observations led to the idea that the volume of oil remaining in a partially depleted reservoir might be measured by injecting gas.

PARTLY DEPLETED volumetric reservoirs are evaluated through calculations hinging on the shrinkage of the oil due to loss of dissolved gas as determined early in the life of the producing field. Where no water drive is present, and no gas cap existed early in field history, calculations based on injected gas give conservative estimate of residual oil. Published by permission of the chief, Illinois State Geological Survey.

All virgin oil and gas reservoirs under pressure are bounded laterally by lensing out of the reservoir rock, by impermeable barriers, or by surrounding water-bearing rock. Such reservoirs are completely full of fluids, and the liquids will contain gas in solution. Volumetric reservoirs without gas caps produce their oil by expansion of solution gas. This article is concerned with the measurement of the amount of oil remaining in such volumetric reservoirs after they are partially depleted.

Measurement Process

The process is illustrated in two ways, first by a simple apparatus shown in Figure 1, and second by a simplified diagram of an oil field shown in Figure 2. This field is shown in perspective in Figure 3.

Consider a tank, A (Figure 1), full of oil containing dissolved gas under pressure. The size and shape of the tank are unknown, but the pressure and the amount of dissolved gas per unit volume of oil have been determined. Part of the oil is drawn off from A, collected and measured at B (Figure 1); the pressure is allowed to fall to atmospheric, allowing all the gas dissolved in all the oil to escape from A. The volume of this gas is measured. (The one atmosphere of gas remaining above the oil in the tank is not considered.)

Subtracting the quantity of gas dissolved in the known volume of vented oil in B from the total measured volume of gas, the remainder is the volume of gas that was originally dissolved in the oil remaining in A. Dividing this by the amount of gas originally dissolved in each unit volume of oil gives the quantity of oil remaining in A. In field practice this means that if you have a record of the original pressure and the amount of dissolved gas in a unit volume of oil and measure the vented oil and gas and water you can determine the amount of oil remaining.

Assume that the volume of gas dissolved in each barrel of oil in A is found to be 500 cubic feet, and the shrinkage of the oil from maximum to minimum pressure is 20 percent.

If the volume of oil in B is four-fifths of a barrel and the total volume of gas liberated from A is 5000 cubic feet, then the oil in B will account for 500 cubic feet, and the difference between 500 cubic feet and 5000 cubic feet or 4500 cubic feet is the volume of gas which has been liberated from the oil remaining in A. Since each barrel of oil in A originally dissolved 500 cubic feet of gas and the shrinkage on the liberation of this gas is 20 percent, then there rema nine barrels minus 20 percent or 7 barrels of oil in A.

Boyles Law Used

Next, the same procedure, as describ above, is repeated but with no measur ment of the escaped gas. The proble is the same, namely, to find the volu of oil remaining in A. The space abo the oil in A is the sum of the amount oil removed, shown at B, and the shrin age of all the oil due to the loss of the gas. This space is then measured a cording to Boyles law by pumping in known volume of gas, allowing the pre sure to equalize and noting the pressu to which it raises the reservoir. shown in Figure 1, this gas will com to equilibrium pressure immediately. the field, gas should be introduce through many wells. Figure 2 is a sim plified diagram showing one injecti well. The time required to attain equ librium will depend on the permeabil of the sand and the number of injecti wells. The degree to which the meth is practical in the field will depe largely on the degree of permeabil of the producing strata and the size the pool. In highly permeable stra such as in the Johnsonville pool, would require only a short time to ra the pressure in the reservoir and bri it to equilibrium.

From the space above the oil at A Figure 1, deduct the volume of oil and the shrinkage of this oil due to l of gas. The remainder is the shrinka of the oil remaining in A. Since t shrinkage is known to be 20 perce the volume of this oil is readily figu as four times the amount of t shrinkage.

The method for measuring shrinka of the oil by injecting a known volu of gas and observing the resulting eq

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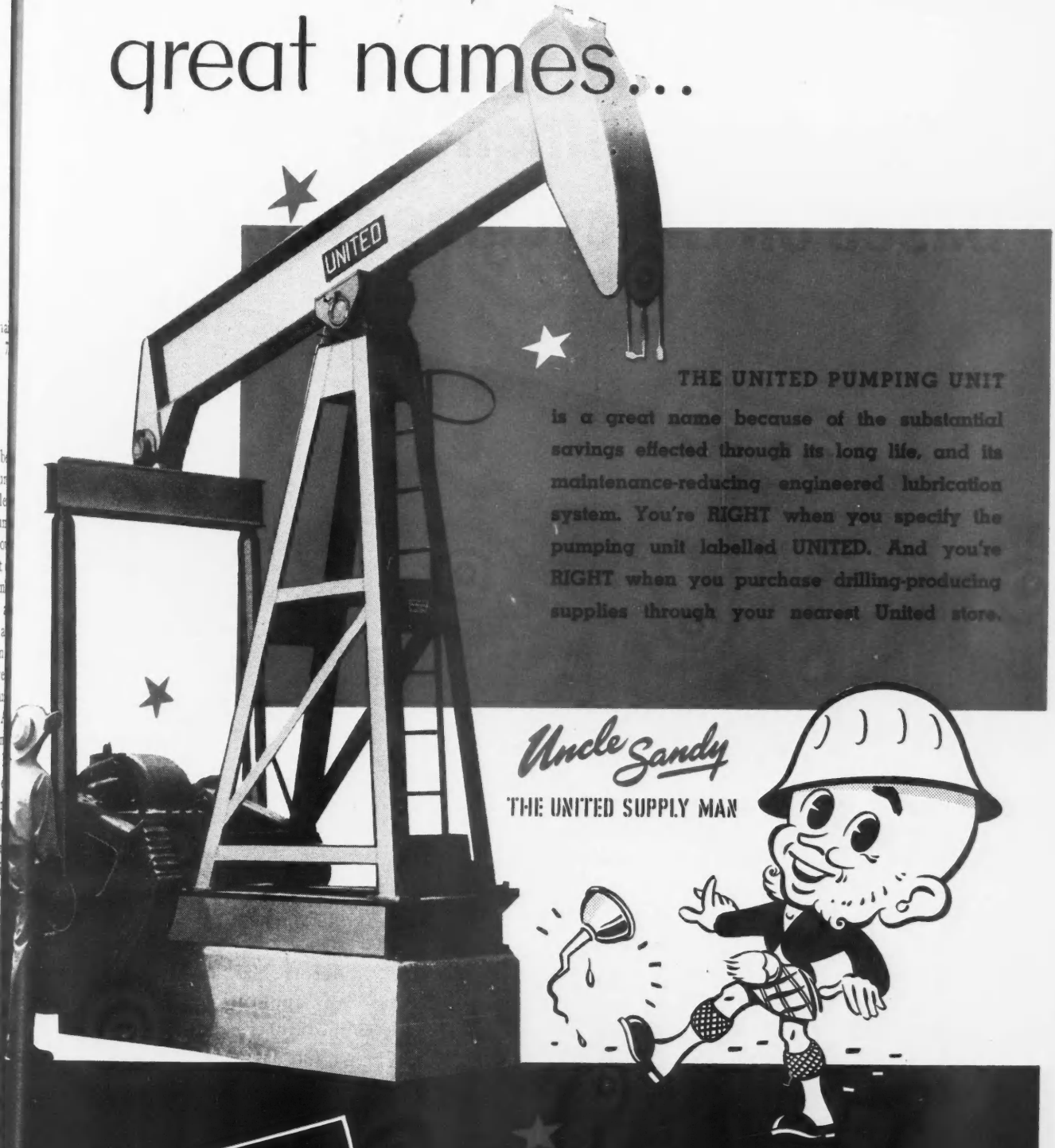

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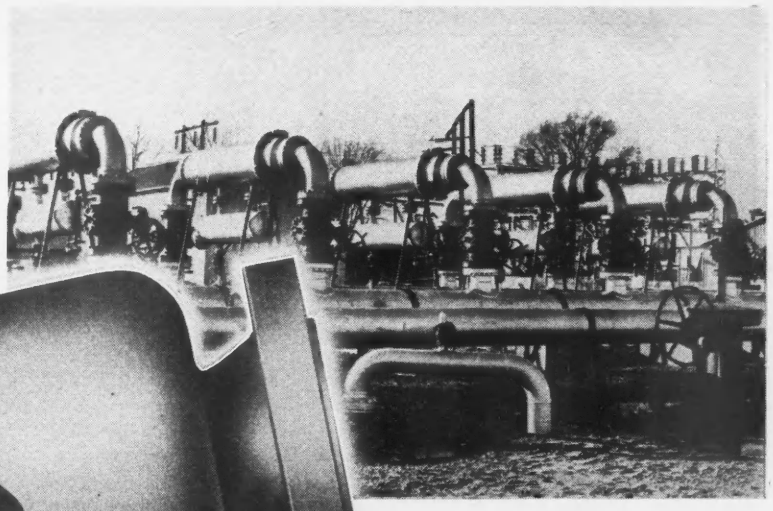

Fig. 1—Five "Big" Aerotec Gas Scrubbers, manifolded to clean 500,000,000 standard cubic feet per day.

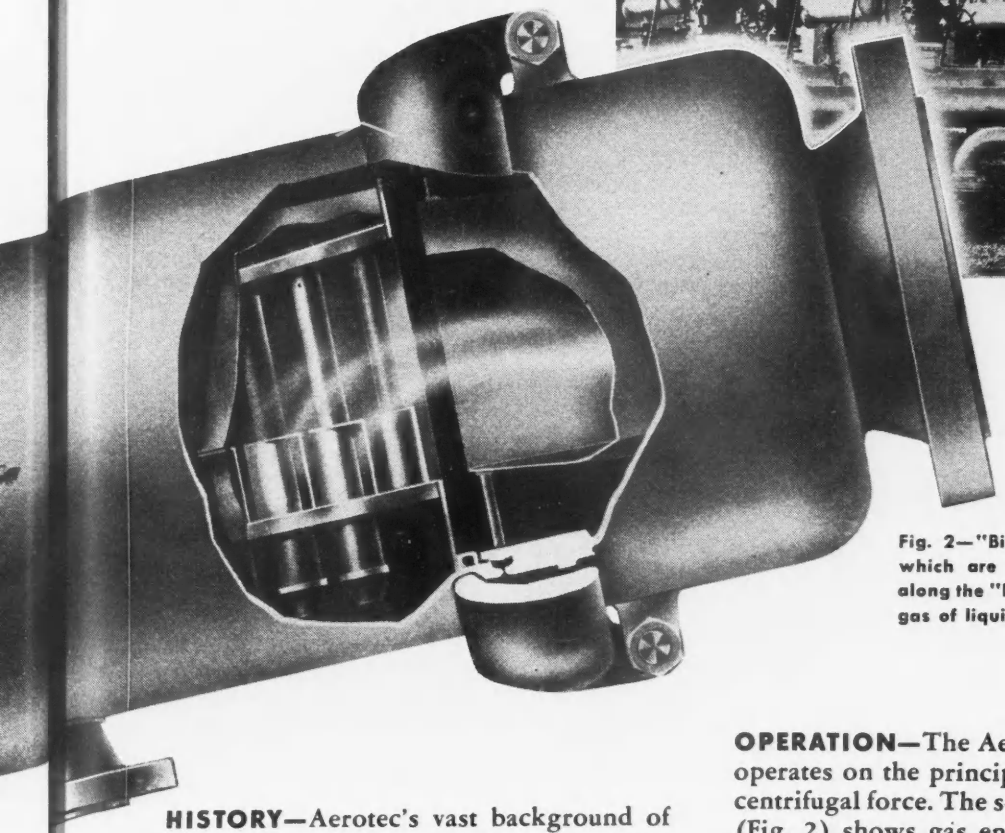

Fig. 2—"Big" Aerotec Unit, many of which are now in use, at stations along the "Big Inch" line, for cleaning gas of liquid and distillates.

HISTORY—Aerotec's vast background of experience in all phases of air and gas cleaning for industry, provided the technical knowledge necessary in applying the Aerotec Tube to gas scrubbing.

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OPERATION—The Aerotec Gas Scrubber operates on the principle of separation by centrifugal force. The sectioned illustration (Fig. 2) shows gas entering at right into tube inlets where it is forced into a descending spiral. Near the lower end of tube a vortex is formed and clean gas spirals upward through the smaller tube into plenum chamber, thence through outlet at left. Liquid, distillates and dust continue on spiraling downward and are precipitated through the two nozzles at the bottom of the pressure shell, into a sump tank for ultimate disposal.

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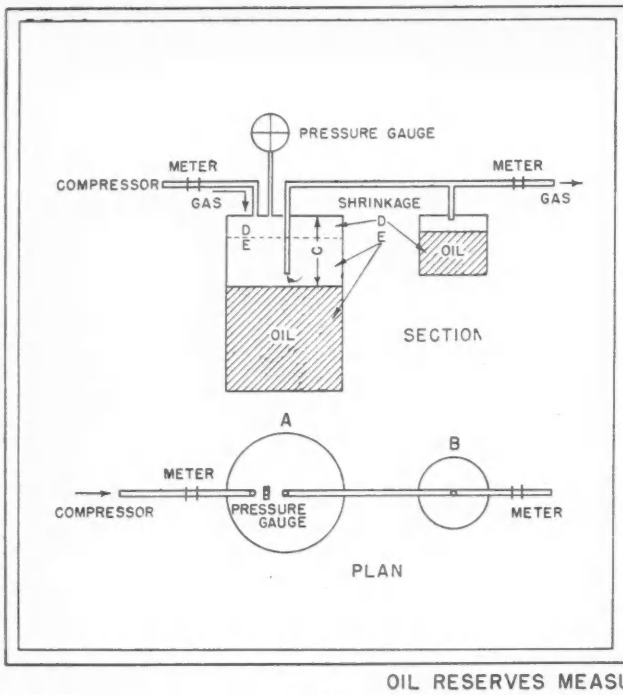


FIGURE 1.

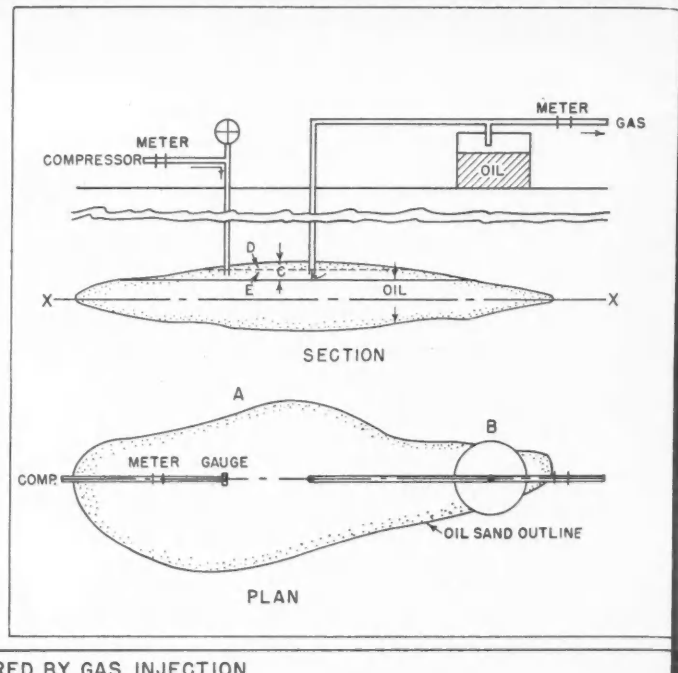


FIGURE 2.

OIL RESERVES MEASURED BY GAS INJECTION

librium pressure may be used to determine the amount of oil remaining in a partially depleted oil reservoir under the following conditions:

1. When the reservoir is volumetric. Such pools are common in the Cow Run sand in West Virginia and in the McClosky lime in Illinois.
2. When pressure, cubic feet of dissolved gas per barrel of oil at the beginning of production, and shrinkage factor have been determined.
3. When total oil and water produced have been recorded.
4. When the sands are highly permeable.
5. When the pool is of moderate size.

Unknown Volume

In the past it has been the common practice in many areas to produce solution gas without metering it so that its volume is unknown. Such a condition is assumed in the following description of a procedure to determine the quantity of oil remaining in a partially depleted reservoir.

Let x = original oil in field in bbls. total (gas-free basis).
a = oil removed from field bbls. (gas-free basis).
s = the shrinkage of the oil due to loss of dissolved gas (fraction of original volume).
v = original oil in field bbls. (before gas loss).
sv = shrinkage in bbls. (for both oil removed and residual oil).
b = volume of void in field calculated from volume of injected gas required to build up a stated pressure.

Then we can see that

$$b = a + sv$$

or

$$v = \frac{b - a}{s}$$

$$x = v - sv$$

$x - a$ = residual oil

Gas Dissolves

This calculation requires, primarily, a good measured value for s. It assumes that when gas is injected into the field to determine b, a negligible amount of this gas dissolves in the residual oil. Since the measuring pressure is low and the time of contact of gas and oil is very short, especially in highly permeable sands, this assumption is justified. If conditions are such that a considerable amount of gas is dissolved during this process it may be tested and a proper allowance made for it in the calculations.

Interstitial water is present in almost every reservoir but since the solubility of gas in water is a small fraction of its solubility in oil, it is believed that the effect of interstitial water is essentially only to reduce the void space so that for the purpose of this procedure water may be considered part of the rock. If there is substantial encroachment of water this procedure is not applicable.

If there is no record of original pressure, it is fairly safe to assume that in most areas it approximates hydrostatic pressure for the depth of the reservoir.

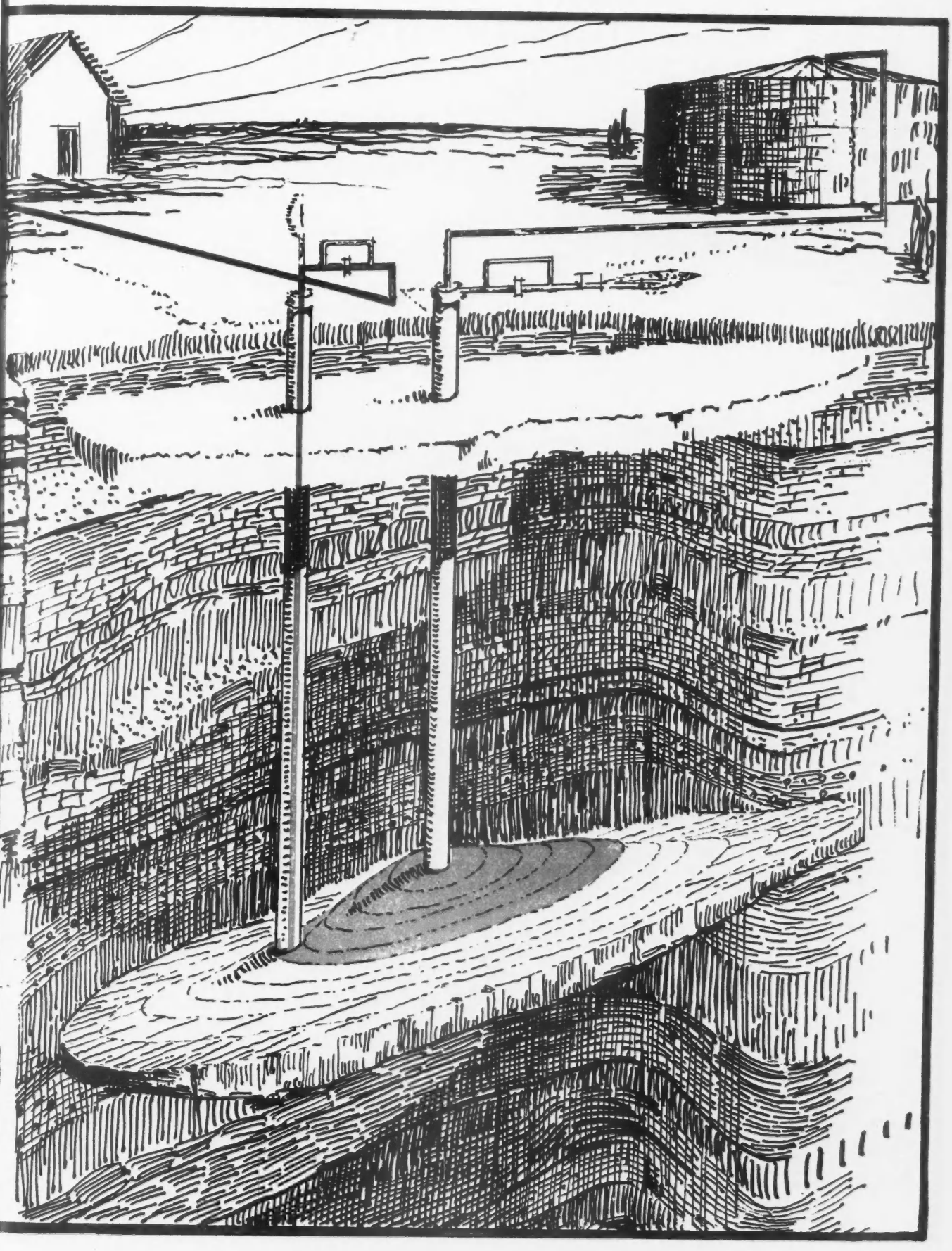
If there is no record of the amount gas originally dissolved per barrel of laboratory tests may be made to det mine the solubility of similar gas in t particular oil at the original reserv pressure and temperature. If the oil the reservoir was not completely sa rated, then the error in calculating amount of remaining oil is on the c servative side.

ACKNOWLEDGMENT

Thanks to J. S. Machin, who set up mathematical statement; A. H. Bell clarified the article; and C. A. Bays, F. Reed, Paul Torrey, William L. Horner, R. Earlougher, Parke A. Dickey, Kurt H. And sen, L. E. Elkins, R. V. Hughes, J. A. Culb son and E. Charles Patton, Jr., who read paper and made valuable criticisms and s gestions.

FIGURE 3.

Perspective drawing of oil field sho connections for gas injection.



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HOW TO—Make Heating Coil to Handle Sump Oi

On most leases, it is necessary from time to time to collect oil from a waste sump and transfer it to boiler fuel tanks or to the regular shipping tanks. When the crude is of the heavier grade, below about 20-degree gravity, pumping the fluid becomes a problem, particularly if the sump has been full a few weeks during which the lighter ends have evaporated away, silt or dust has collected in the oil, or if cold weather has increased viscosity of the oil. One company has devised an inexpensive means of locally heating the oil just before it enters the suction line of the pump, a method which eliminates the necessity of heating the entire sump full of oil to transfer it into the tanks.

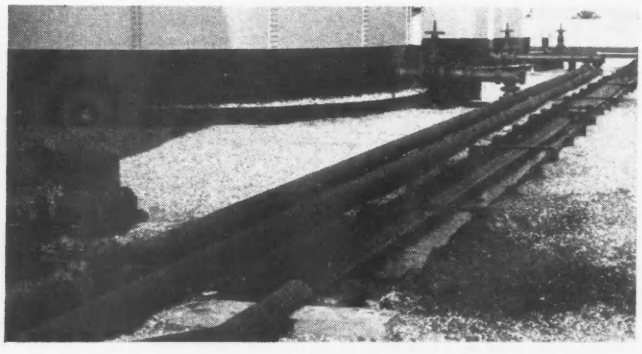
At the point where the suction line is laid in the sump, a small area is boarded off, the planks being laid in such a manner to give sump oil access to the smaller enclosure, and also to insulate the inner pond from the outer or main body of oil. A tightly-wrapped steam coil several feet long, made of 1½-inch

pipe, is slipped over the end of the intake line as shown. The coil effectively heats the oil as it is pulled into the line and supplies additional heat to the fl several feet of the line. The coil may rested directly upon the ground, but allow as much circulation as possi around the steam coil, the pipe is c tered inside the coil, using a light ca for this purpose. It is attached to end of the line and secured to a pl form structure overhead. Provision o swing in the intake line to allow mo ment of the pipe facilitates shifting the intake as desired.

Installation of swing joints and lu cated swivel joint elbows in the ste and return lines just above the coil si plify not only the initial installation, subsequent adjusting and maintena of the heating unit. It is inexpensive build, and if good quality pipe is u in the coil itself, bending into the tight wound, 22-coil heating unit will not p sent a difficult problem. Diameter of coil may be varied according to gravity of the oil, size of the pump intake line and general sump conditi in each case.

HOW TO—Drain Sediments with Removable Flum

When building a flume in front of a battery of stock tanks to lead sediments to a common sump for final disposal, a method can be followed which results in a flume that can be removed with a minimum loss of material. The flume itself is made of sheet metal in sections of convenient length for handling. The flume is in the shape of a rounded bottom trough with the edges, where sections meet, overlapping for soldering, or welding with a sheet metal torch. At about four-foot intervals, lugs are riveted on opposite sides near the rim of the flume to rest on angle iron posts driven in the soil.

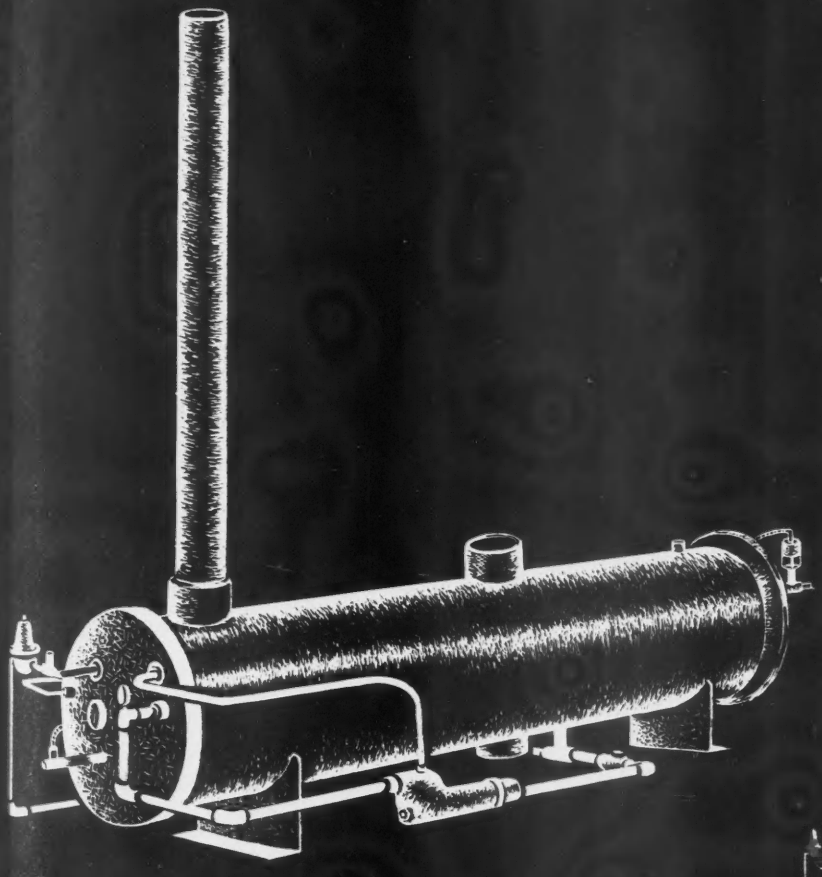


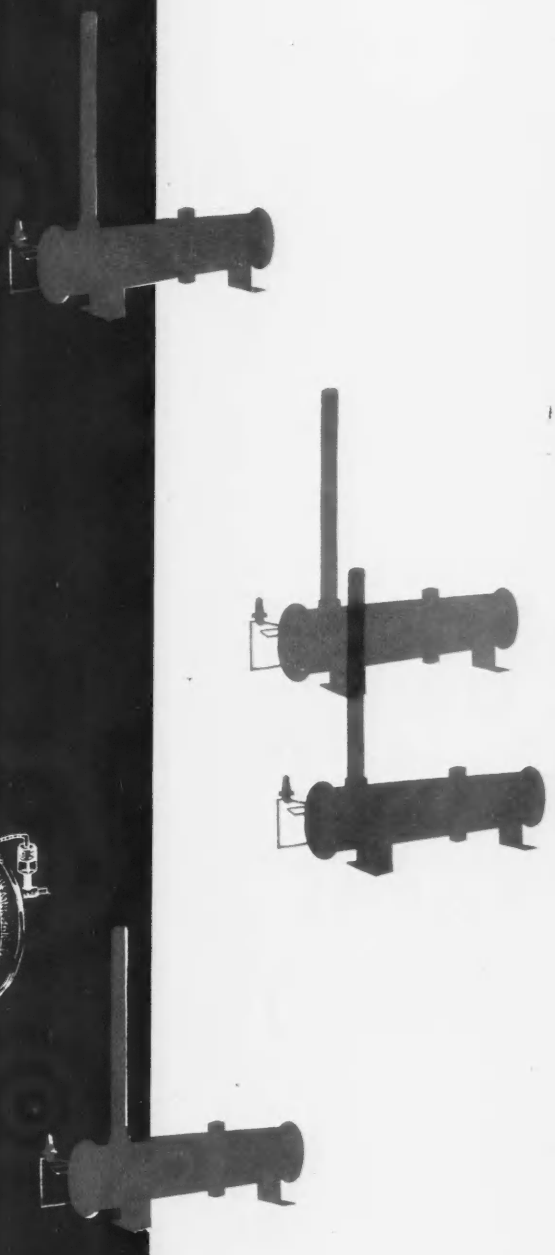
One side of the angle is turned o to present a flat top through wh tank bolts are passed to connect lugs on the flume to the suppo Where sections connect, there are cr members reaching across the flu from opposite posts and bolted w the bolts which connect the lugs to supports. This is done to prevent spre ing at joints so leaks will be elimina The flume is laid in a shallow tre excavated to a depth which brings top of the posts and the rim of flume to a point slightly above gro level. If, during long use, the flume quires repairing, the damaged sec can easily be removed and welded, replaced with a like section from st or made on the job.

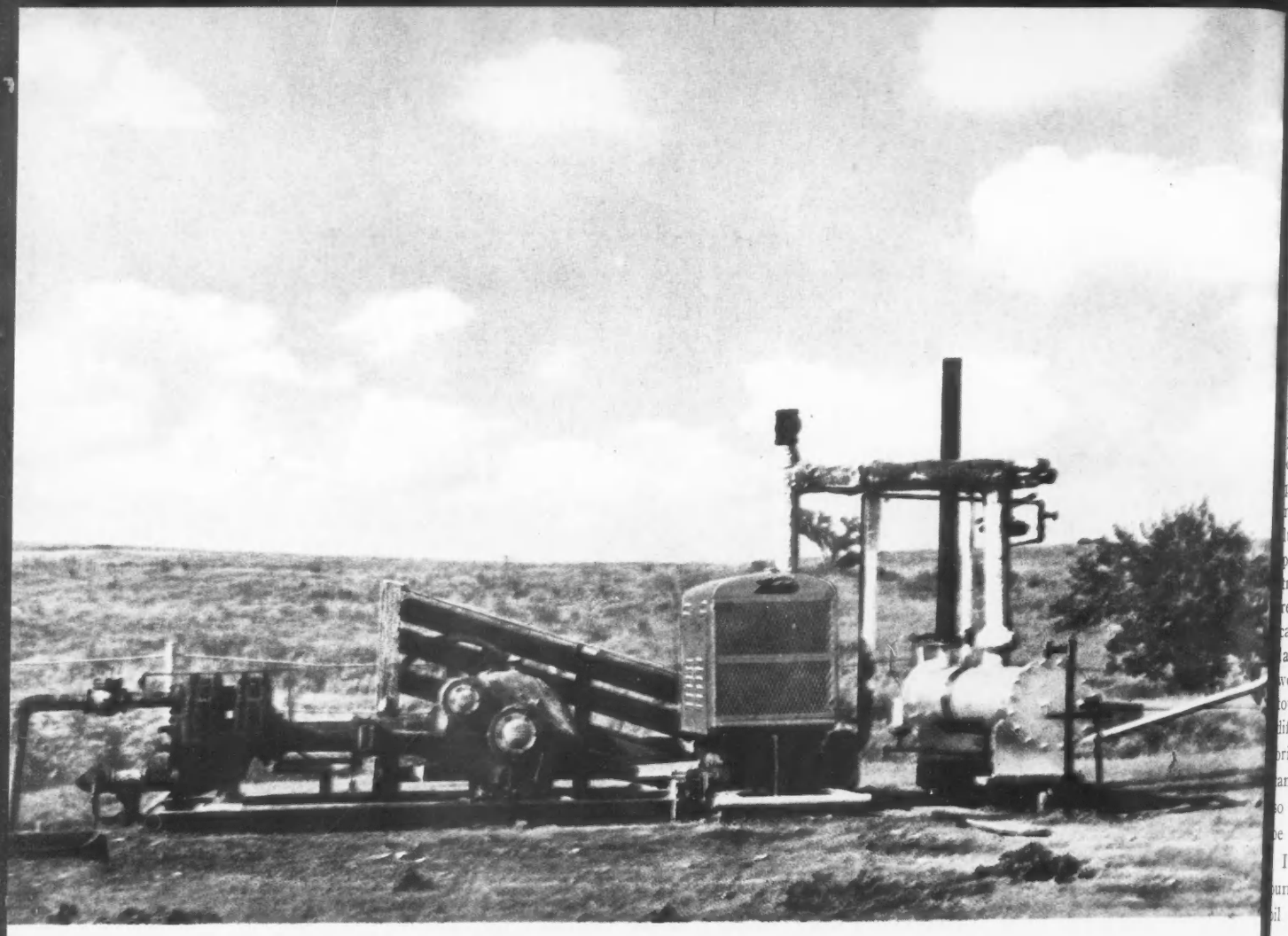
Dependable power source

You can always depend on the BS&B Fuel Vaporizer to supply you with enough fuel gas for your gas operated engines. No transportation problems, no storage problems, no supply problems because the BS&B Fuel Vaporizer is a self-contained power source. It strips the more volatile fractions from the crude circulated through the vaporizer and then passes it on to your engines in the form of vapor. The cost of operation to you is minimized . . . the services rendered, immeasurable. Check on it today!

Black, Sivalls & Bryson, Inc.







NOW . . . Top Crude For Gas Engine Fuel at a MINIMUM of Cost to You

With the new BS&B Fuel Vaporizer, you can now top lighter hydrocarbons from the crude for use as fuel for your gas engines at a minimum of cost to you.

Actually, the Fuel Vaporizer is a miniature topping plant. It heats the crude circulated through the vaporizer to the desired temperature, strips the more volatile fractions from the crude and then passes the lighter hydrocarbons to the engine in the form of vapor. The heavier crude bottoms are then cooled and returned to the crude source or pipe line.

The amount of gas generated by the Fuel Vaporizer depends on the quantity of crude circulated through the vaporizer and the temperature to which it is heated. The Fuel Vaporizer can be used wherever a sufficient quantity of crude oil of 28 API or higher is available. On pumping stations, only a minute quantity of the crude being pumped through the station is circulated through the vaporizer. On leases, the quantity required for the vaporizer can be taken from the treater or stock tank, circulated through the vaporizer and then returned to stock. The entire operation is so simple and the final cost of operation is so negligible, you will be amazed.

As you know, crude used on a lease is neither subject to royalty nor is it chargeable against production allowable. Lighter fractions of crude are often lost in storage on leases. By using the Fuel Vaporizer, these lighter fractions are utilized as fuel gas for the engine. The only heat utilized by the vaporizer is the heat from the exhaust of the engine, and in normal operations, this heat, too, is usually wasted. The cost of the fuel generated, then, can be reflected in a gravity reduction of the crude circulated through the vaporizer. This gravity reduction, however, is so slight, it hardly can be measured.

We will be glad to send you more complete information about the new BS&B Fuel Vaporizer. Write or mail the coupon today.

BS&B FUEL VAPORIZER

Oil Field Equipment Division, BLACK, SIVALLS & BRYSON, INC.
720 Delaware, Kansas City 6, Missouri

☐ Please send complete details concerning the new BS&B Fuel Vaporizer
☐ Arrange to have a Sales Engineer call on me.

NAME _____

FIRM _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

SEND COUPON NOW

for complete information concerning the new BS&B Fuel Vaporizer.

BLACK, SIVALLS & BRYSON, INC.
Kansas City, Mo. Oklahoma City, Okla.

HOW TO—Unitize Lubrication Setup

Where a large number of individual engine pumping wells are being serviced daily, the job of keeping the working parts properly lubricated has been simplified by mounting motor oil, crank case lubricant and grease pumps on a two-ton truck with hose and reels so one man can quickly service a large number of wells during daylight hour. As many as six different types of lubricants can be carried with the reserve tanks filled at the beginning of the day, so the designated schedule of wells can be serviced as required.

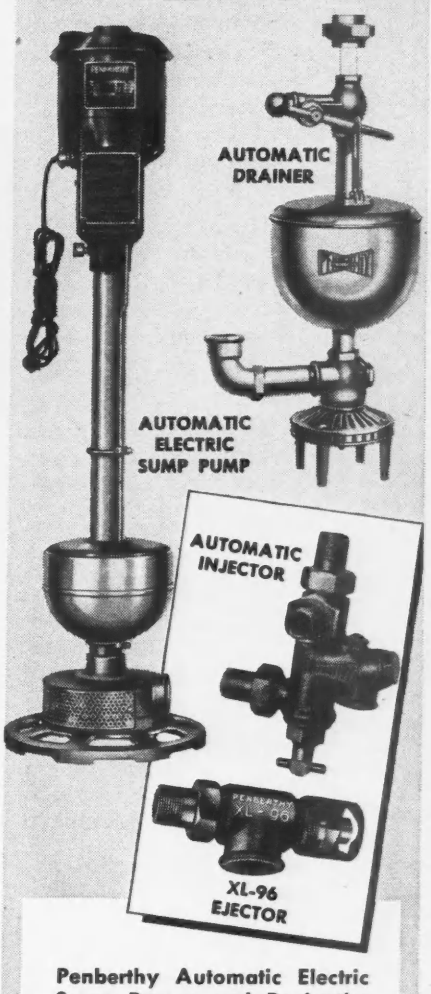
If the gas engines which operate the pump jacks are equipped with exterior oil reservoirs to maintain a full crankcase at all times, the service man picks up the hose from the drum of the specified type of oil for the crankcase and meters the oil into the small barrel or drum. Pressure fittings are handled in the same manner as if servicing an automobile. Not only is the job of well servicing expedited, but supplies are conserved by efficient metering of lubricants instead of drawing from a drum into a measuring can, and then pouring into the lubricator or crankcase.

HOW TO—Provide Fuel Line Shutoff

A quick open-and-shut valve can easily be adapted to function when emergency conditions require that a fuel line be shut off, or when essentially the same conditions require spray water to be turned on. Near the equipment where a fire hazard exists and which is supplied with fuel gas under pressure, a fusible link is inserted in a wire line at a point where the most immediate need is determined. In the fuel line where the quick open-and-shut valve is connected, a guide box is provided for a weight heavy enough to pull the handle down at the moment the fusible link is melted.

The wire line is attached to some part of the equipment so the fusible link is placed at a point where highest temperature may be expected, and the other end of the line is connected to the fittings on the quick open-and-shut valve. The weight is attached to the handle fitting with a clevis and pin so that it will assume a normal vertical position when falling into the guide box. The fitting on the gate handle is a slotted cross piece so minor adjustments can be made for the wire line and the actuating weight in the guide box. If spray water is required to quench a fire or cool equipment when subjected to high temperature, the valve can be reversed so that it is normally closed, but will be opened instantly when the fusible link is parted due to melting.

PENBERTHY
Quality
Products



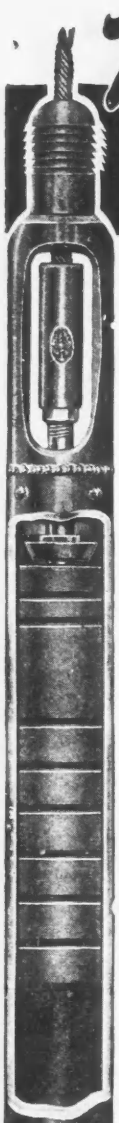
Penberthy Automatic Electric Sump Pumps and Penberthy Automatic Drainers (water or steam operated) have demonstrated their superiority wherever seepage water accumulates. Simple rugged design—copper and bronze construction throughout.

Penberthy Automatic Injectors assure an uninterrupted supply of feed water to oil field boilers at minimum cost. Reliable under most severe operating conditions.

Penberthy Ejectors use the power of steam, air or water under pressure to lift liquids. No moving parts—no lubrication. Also used as water heaters.

3277-A

PENBERTHY INJECTOR CO.
Detroit 2, Mich.
Canadian Plant—Windsor, Ontario



Miller

SAND PUMPS

Standard Clean-out Tool for 25 Years

Check any oil field in the world where sediment or sand is met with and you'll find Miller Sand Pumps and Bailers are standard . . . leadership earned and held by continuous improvements during 25 years of service!

The Miller Sand Pump is made in Regular and Heavy Duty types in sizes listed below. Lug type Chisel, Sand and Bailer Bottoms are easily interchanged.

Threaded Chisel and Sand Bottoms can be supplied, to permit larger pieces of sediment to pass, and pump to be dumped without removing bottoms. Tool Pin bail allows tools and sand pump to be run on same wire line when desired.

Write for new descriptive price list on Miller Sand Pumps and Bailers. See Composite Catalogue page 2666 for details.

SAND PUMP AND BAILER SIZES:

Outside Diameter
2½"
3"
3½"
4¼"
5"
5½"
7"

Lengths
20 feet
25 "
30 "

Special Sizes and Lengths to Order!

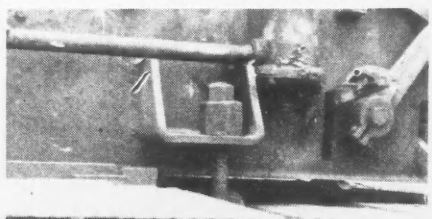
EXPORT OFFICE
30 Rockefeller Plaza
New York 20, New York

MILLER SAND PUMP CO.
1524 S. E. 29 • Box 4516
OKLAHOMA CITY 9, OKLAHOMA

PRODUCTION HINTS

HOW TO—
Fix Pulling Unit

Much time ordinarily is lost in the rigging-up of the truck-mounted pulling unit at the well when the unit is blocked up and anchored. The practice of standardizing facilities at all wells so that setting-up of the unit always will be the same, not only assures reduced pulling costs, but generally more secure

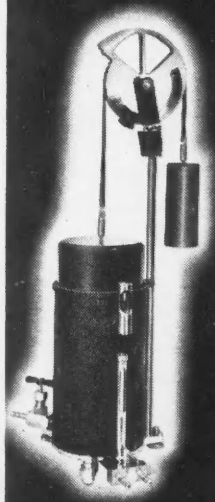


and dependable installations as well. One company whose wells in a certain area still are equipped with steel derricks employs a simplified type of anchor which requires but a few minutes to rig up.

The anchor consists of a U-shaped bolt having a long shank which extends from near the base of the hoist down to where it can be engaged on the under side of the channel iron substructure member. One such hook is mounted on each side of the pulling unit. Once positioned, the bolt easily is cinched down, the threaded end and tightening nuts being exposed in a readily accessible point above the level of the derrick floor. Added strength is given the 90-degree turn of the bolt by welding to its back side a section of one-half inch steel plate.

One of the advantages of this type of anchor lies in the fact that there is no need to precisely spot the truck over a pre-determined point in order to assure a vertical anchor hold-down.

GASOMETER *Readable to* **.0001 Cu. Ft.**

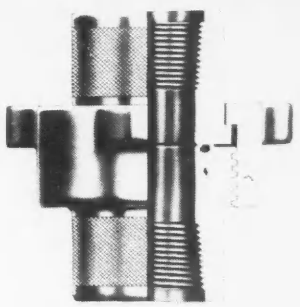


Gas collected over mercury to prevent contamination or loss of gas. Capacity 0.15 cu. ft. Readable to .0001 cubic feet. Can also be supplied calibrated in liters or cubic centimeters.

CIMCO

COLEMAN INSTRUMENT
and Manufacturing Company
716 SOUTH TROOST TULSA, OKLAHOMA

For STEAM



It's the YALE UNION

You'll save lots of time and lots of money using YALE UNIONS on your steam lines, boiler connections and headers. High temperature O-Rings provide positive, pressure-tight security . . . and you don't have to use a sledge hammer to obtain it.

Try one YALE UNION just once on your steam connections . . . or on fluids, vapors or vacuum. You'll use them in every service thereafter. They're available through your supply store, in all popular sizes, for working pressures to 7500 psi.

YALE MACHINE WORKS
4403 Yale Street Houston, Texas
Export: R. S. Stokvis & Sons, Inc.,
17 Battery Place, New York, N. Y.

HERE'S NEW AND GREATER

Protection!

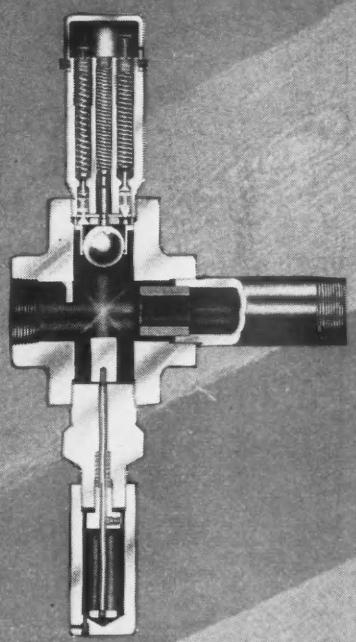
AGAINST

- EXCESSIVE PRESSURES . .
- FLOW LINE BREAKAGE . .
- STORM AND HURRICANE

FOR ALL PRODUCING WELLS

ROBERTS Automatic SHUT-OFF VALVE

(Meynig Pattern—Patents Pending)



AUTOMATICALLY closing against any predetermined high or low pressure, the Roberts Shut-Off Valve is a double-acting safety valve that reduces damage, danger and loss caused by flow line breakage to an absolute minimum; it protects flow lines and separators against excessive pressures; it further permits all wells flowing into one separation point to be closed simultaneously simply by closing one central control valve at the point of separation.

Designed originally for use on marine wells to provide safety and protection in event of line breakage caused by high pressure, dragging anchors, storms and hurricanes, the valve has proved highly successful on all producing wells . . . flowing, pumping or gas life . . . whether they're on land or water. It is of special value in areas where paraffin or ice threaten flow lines.

Light weight, low cost, easily installed on any well, upstream or downstream from choke, the valve has opening and closing pressure ranges from 5 to 3000 p.s.i., to cover practically every producing condition.

The Roberts Shut-Off Valve uses vary from switching tank to closing suction on pipe line run tanks.

For complete information, write for latest Bulletin.

ROBERTS PIPE & SUPPLY CO.

Oil Field & Industrial Supplies

5016 Griggs Road

HOUSTON 4, TEXAS

When
You
Rely On
SAND-BANUM
for the
Safe and Certain
Removal and
Prevention of
Boiler Scale
and Corrosion

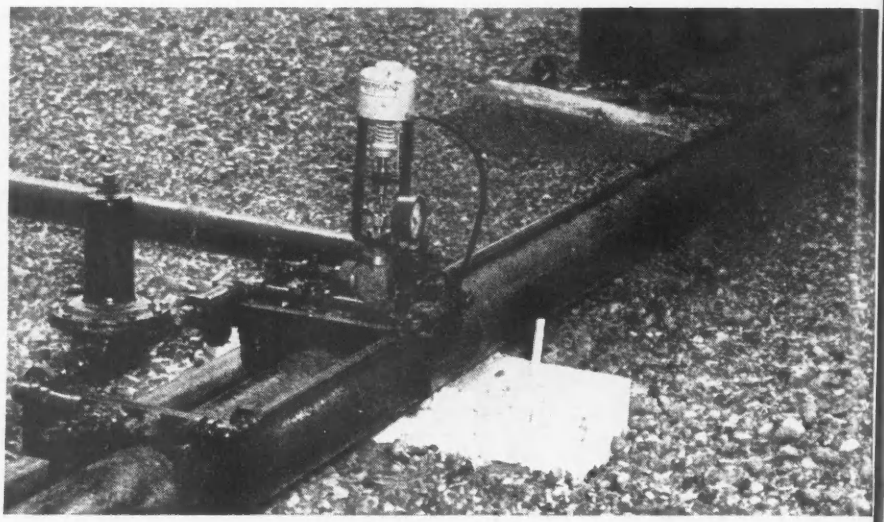
For 23 Years
Sand-Banum Has Proved
Its Reliability in
World-Wide Use.

SEND
for Details of how to
SAVE IN SAFETY
with
SAND-BANUM

"The Entirely Different Boiler and Engine Treatment"

AMERICAN SAND-BANUM COMPANY, Inc.
9 ROCKEFELLER PLAZA,
NEW YORK CITY 20

HOW TO—Control Gas Line Heaters



An unusual hookup for controlling the heaters in gas-condensate flow lines is designed for installations where the problem of hydrate formation is a serious one. Instead of locating the fire controls immediately downstream of the gas line heater, this installation was made approximately 1000 feet downstream of the heater.

The thermometer element is housed inside a section of three-inch pipe which has been welded to the gas line so that part of the line is exposed to the inside of the smaller pipe. Both ends of the top pipe are sealed so that oil can be placed around the thermometer element inside the protective pipe. A flexible cable leads from the enclosed element to the regulator. A three-quarter round portion of one-inch pipe tack-welded to the gas line serves as a protective covering for the flexible cable.

The controlling unit is mounted on two pieces of flat steel which have been welded to the gas line as shown. Fuel gas for the heaters is taken from a low pressure field gas line, and the pressure is further lowered by the regulator shown. The gas then passes through a strainer, through the thermostatically controlled valve and on to the heaters.

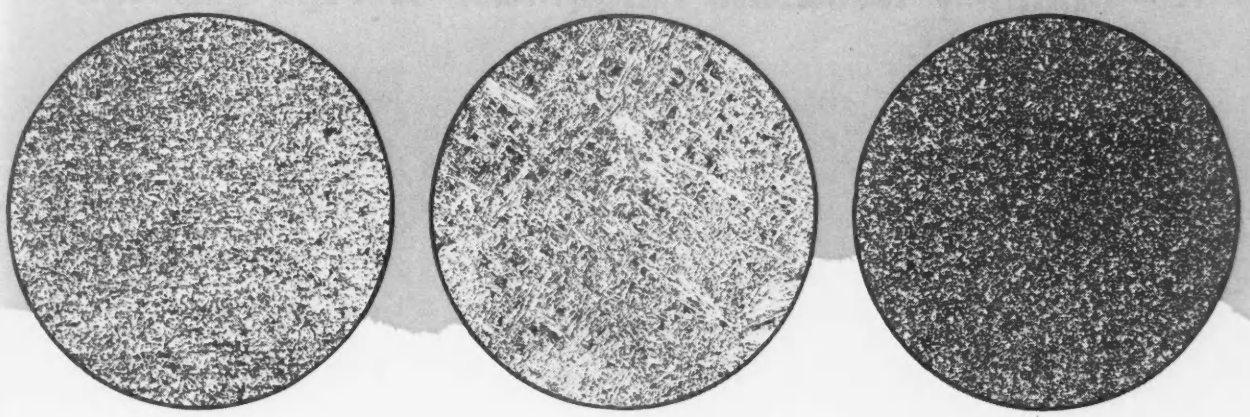
When the gas line temperature drops below the dew point in the line (about 70° F. in this case), the thermostatic valve opens and fires the heaters until line temperature is increased to a predetermined value. This type installation will maintain a more even temperature in the gas line even though there is a wide variation in atmospheric temperature between night and day.

Completely Air Conditioned **4 CONVENIENT LOCATIONS**

LOMA ALTO HOTEL — **4518 LEMMON AVE.**
LAWN HOTEL — **3718 LEMMON AVE.**
LAKEWOOD HOTEL — **1818 ABRAMS RD.**
LYNN HOTEL — **3405 GASTON AVE.**

DALLAS, TEXAS

GRADE "W"...Newest addition to the "Oilwell" Line of QUALITY SUCKER RODS



These photomicrographs show the grain structure of "Oilwell's" new Grade "W" Sucker Rods and illustrate the refinements achieved through scientifically controlled heat-treatment.

1. **AS ROLLED**—Rod stock is rolled sufficiently oversize to insure full cross-section after processing; then cut into rod blanks. Although grain structures on Grade "W" steel are relatively small to begin with, they do not have the required physical properties.

2. **AS FORGED**—The forging heat has produced a coarsened grain structure. Further heat-treatment is necessary to give these rods the ductility and hardness over their entire length, required to resist impact and fatigue stresses encountered in severe service.

3. **AFTER COMPLETE HEAT-TREATMENT**—The grain structure of Grade "W" rods, after liquid quenching and tempering, is the ultimate in grain refinement—providing best balance of strength and toughness, while retaining corrosion resistance for severe uses.

...gives you *higher-strength rods* to *reduce your costs* in pumping deep wells

THIS new "Oilwell" rod has been created to meet the Industry's ever-increasing requirements for reasonably priced rod strings that will withstand the high stresses encountered in pumping deeper and deeper wells. It is specifically designed for long-stroke, slow-speed pumping operations. Its high alloy content and full heat-treatment (including quenching and tempering) give this rod good resistance to corrosion and fatigue. It is recommended for service in wells where severe corrosive conditions are not encountered.

The high yield-strength achieved in Grade "W" rods allows much longer strings before tapering to larger rod sizes. This represents a real saving in operating costs because it results in:

1. Smaller pumping unit
2. Less weight at the polished rod
3. Less counter-balance required
4. Smaller size tubing
5. Higher factor of safety against breakage

"Oilwell's" exhaustive metallurgical research and scientific heat-treating practices add far more to the service life and trouble-free performance of sucker rods than they do to the cost. That's why so many users are standardizing on the "Oilwell" fully heat-treated rod which best meets their specific requirements.

PHYSICAL PROPERTIES (Grade "W" Specifications)

Yield point	psi.	100,000—110,000
Ultimate tensile strength	psi.	115,000—125,000
Elongation in 4 diameters	%	23—28
Reduction of area	%	65—75
Brinell hardness number		228—255
Izod impact	ft. lbs.	80
Allowable loading (*Non-corrosive service)	psi.	40,000

*This allowance should be reduced, depending upon the nature and severity of the corrosive condition encountered.

SIZES AVAILABLE

¾, ⅞ and 1-inch sizes in 30-foot lengths (only). A.P.I. pin-and-pin with hardened-and-ground couplings.

For detailed information on "Oilwell" Sucker Rods for any application, see your nearest "Oilwell" representative.

OIL WELL SUPPLY COMPANY

Branches Serving All Oil Fields

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COLUMBUS, OHIO...DALLAS, TEXAS
HOUSTON, TEXAS...TULSA, OKLAHOMA
LOS ANGELES, CALIFORNIA

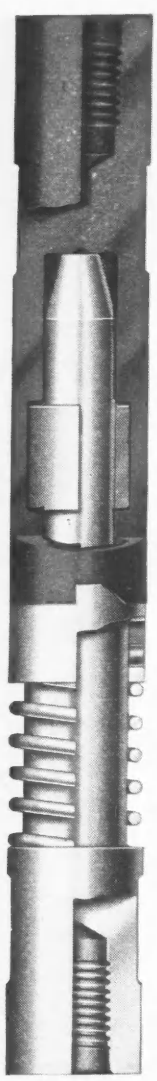
"OILWELL"

UNITED STATES STEEL

HOW TO—Simplify Accurate Alignment of Pipe Fittings

When short lengths of pipe and fittings requiring accurate alignment are to be assembled in the field, the welder can save considerable time by attaching a length of two-inch angle iron to the rear edge of the truck bed. As shown in the photograph, the angle iron does not interfere with normal work on the top of the flat bed. Fittings of the same diameter when laid along the angle are automatically aligned, permitting tack welds to be made quickly and easily

without having to make temporary supporting jigs. By extending one end of the angle iron past one corner of the truck bed, welding of flanges or special fittings to the pipe is greatly facilitated.



PAGE ON & OFF ATTACHMENT

PAGE TENSION TOOLS

Easy engagement
Easy release
A RUGGED
Rod-to-Plunger Connection

THAT'S THE PAGE

SUCKER ROD ON and OFF ATTACHMENT

The Page On & Off Attachment provides a quick, effective means of joining sucker rods to the pump plunger in tubing and casing pump installations. Its proven design permits removal and replacement of sucker rods without disturbing the pump plunger—a foolproof clutch-type locking mechanism eliminates chance for failure even under the severest of pumping conditions.

The success of the Page On & Off Attachment has prompted many operators to switch to larger volume pumps. The result—immediate payout for the changeover through increased production.

SIMPLE CONSTRUCTION—SIMPLE OPERATION!

Simplicity of construction is the keynote of the Page On & Off Attachment. There are no threads to gall, no complex mechanism to foul up. The tool consists of a male and female section which interfit and interlock when the sucker rods are lowered onto the pump plunger. A ¼ turn left rotates shoulders on the male section into milled out slots in the female section. During rotation a locking clutch engages by force of a helical spring positioned below it.

Disengagement of the tool requires only slight up strain and a ¼ turn right. This forces the clutching sleeve down and permits rotation of the female section for disengagement from the male section. Both the male and female sections are milled and turned from solid billits of steel and are held to close tolerances to virtually eliminate chance for wear.

Tear out this page—enclose it in an envelope and mail to Page Oil Tools, Inc., Long Beach, California, for further details.

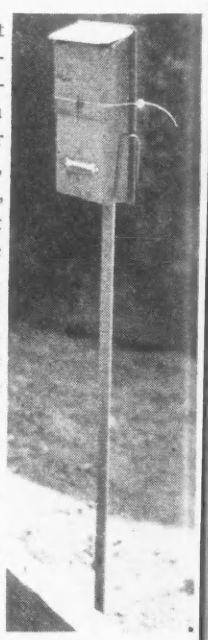
PAGE OIL TOOLS, Inc.
3356 Lime Ave., Long Beach 7, Calif.

Mid-Continent Distributors

D+B Division—Emsco Derrick & Equipment Co., Garland, Texas

The Continental Supply Company Dallas, Texas

HOW TO—Rig Message Box



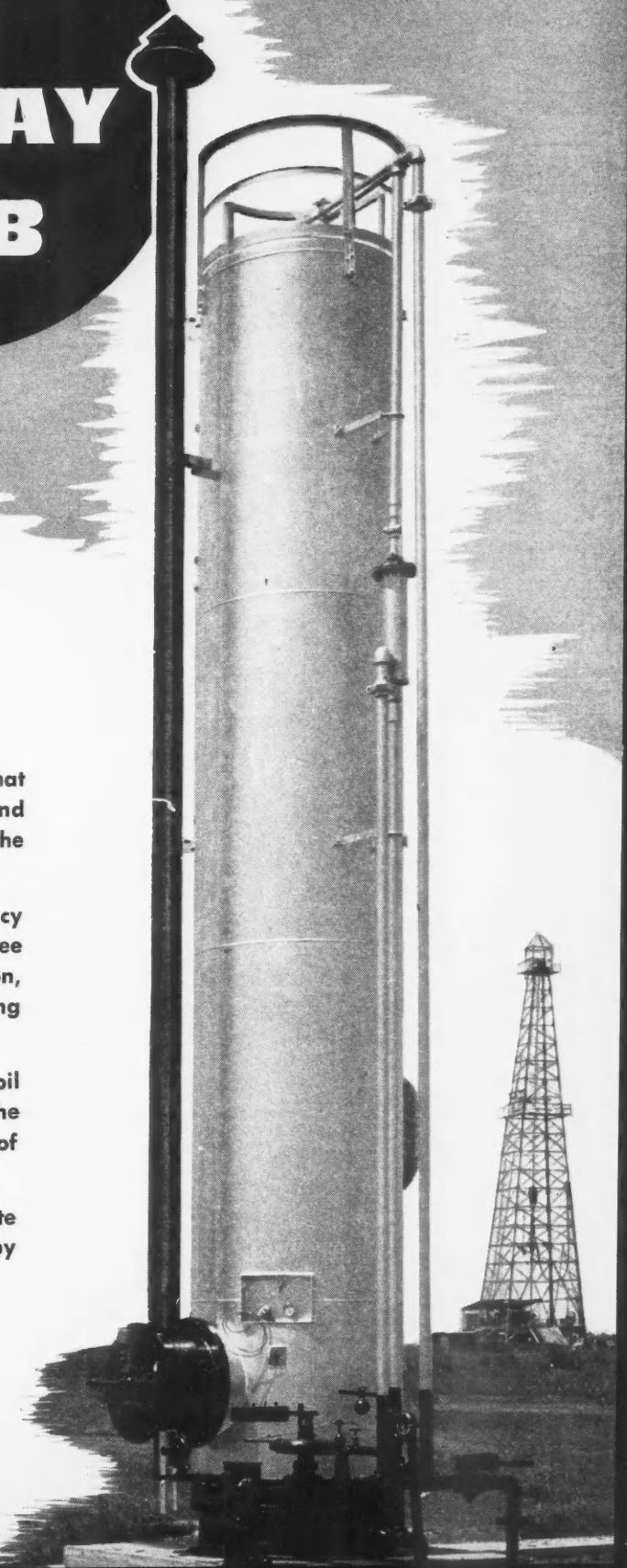
An ordinary sheet metal mail box provides a means of saving time of field men and tank gauger when lease records, receipts or run tickets, or other important messages are to be left for the operator. The box is mounted on a one-half inch pipe post set in the ground beside the tank battery or other centrally convenient point on the lease.

Since the box is intended only to prevent curious prying or tampering on the part of passers-by or children in the vicinity, no attempt is made to construct the box of heavy material or more costly fabrication. For the field men, a small padlock may be used to lock the main door of the box. The tank gauger can wrap the box with one of his valve seals, running one end of the wire through the hasp on the front of the box, as shown.

ARKERSBURG EMULSION TREATERS

DO A 4 WAY JOB

1. THEY SEPARATE
2. THEY ACT AS A SETTLING TANK
3... THEY HEAT
4... THEY TREAT



It's only with Parkersburg's exclusive design and features that you get this superior Emulsion Treater service. Self-insulated and with built-in heat exchanger, Parkersburg Treaters eliminate the need for costly outside pre-heating and cooling equipment.

Two oil settling compartments greatly increase the efficiency of Parkersburg treaters. The initial compartment acts as free water knockout and heat exchanger so that pre-heated emulsion, with all free water removed, is introduced into the main settling chamber.

Parkersburg's exclusive heat-transfer method cools the clean oil and pre-heats the incoming emulsion as it travels down the double-jacketed annular space. The very maximum gravity of oil is transferred to your storage tanks.

Talk to a Parkersburg Representative about the complete economics and advantages of the 4-Way job done by Parkersburg Treaters.

THE PARKERSBURG RIG & REEL CO.

PARKERSBURG & OCS PRODUCTS

GENERAL OFFICES, PARKERSBURG, W. VA.
Plants at Parkersburg, W. Va., Coffeyville, Kan., Houston, Texas

District Offices:
Dallas - Houston - Los Angeles - Tulsa - New York

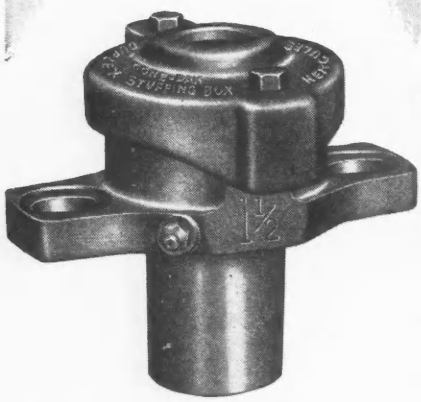
OCS

P A R K E R S B U R G

NEW

HERCULES LUBRICATING UPPER GLAND

Protects polished rod and liner against excessive wear



Designed with a minimum of parts for easy installation and economical operation. This new lubricating gland lengthens the life of the rod or liner as well as the packing in the stuffing box. On various tests, the life of the polished rod or liner and the packing in the stuffing box was increased many fold. Equipped with a zerk fitting to insert bearing grease and with a regular Hercules cone packing ring, serving as a wiper ring. Fits all type Hercules stuffing boxes now in use.

Write for Bulletin No. 124-SBLG

HERCULES TOOL TULSA

SOLD AT ALL SUPPLY STORES

California Representative:
L. T. (Ted) WALTIMIRE
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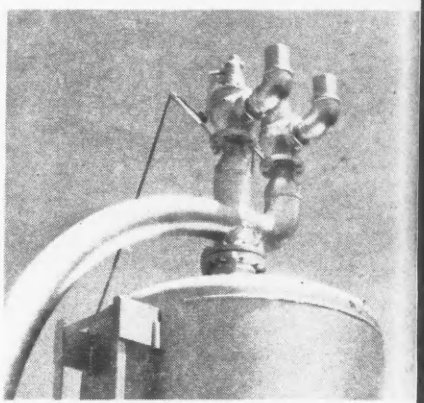

To prevent the line from whipping when blown by the wind, a ferrule may be attached to the vessel as an anchor and guide. If the safety valves are for normal connections with a screw end, companion flanges can be attached to the valve end and a swedge nipple at the top of the vessel. The guide arm is attached to one of the flange holes instead of a flange bolt.

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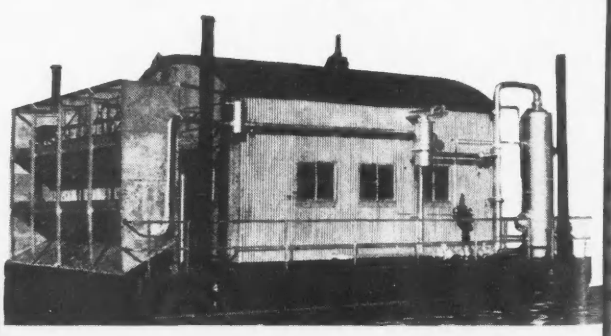
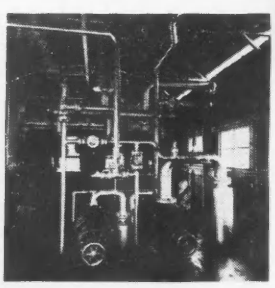
Below—Interior view of Barge showing compressor.





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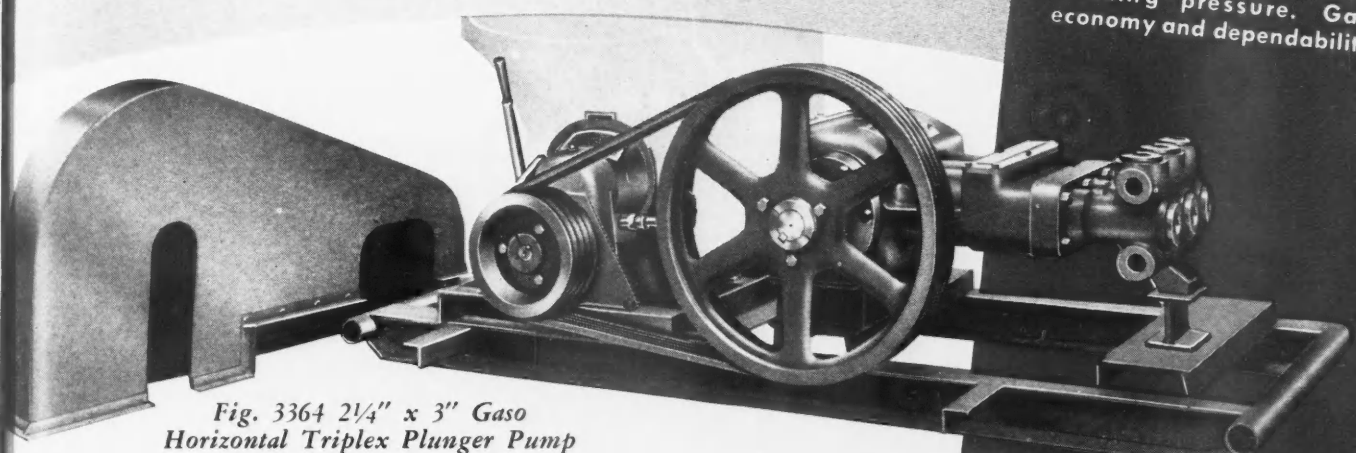

Fig. 3364 2¼" x 3" Gaso Horizontal Triplex Plunger Pump

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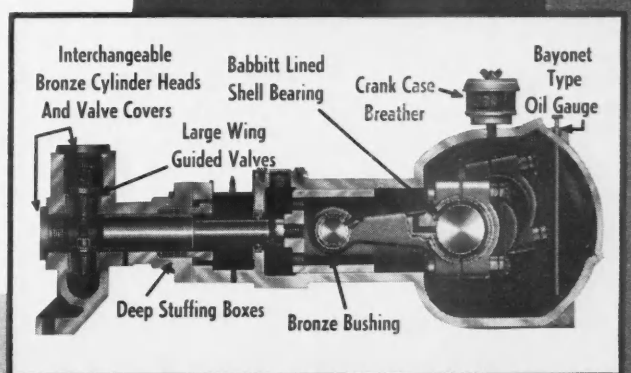

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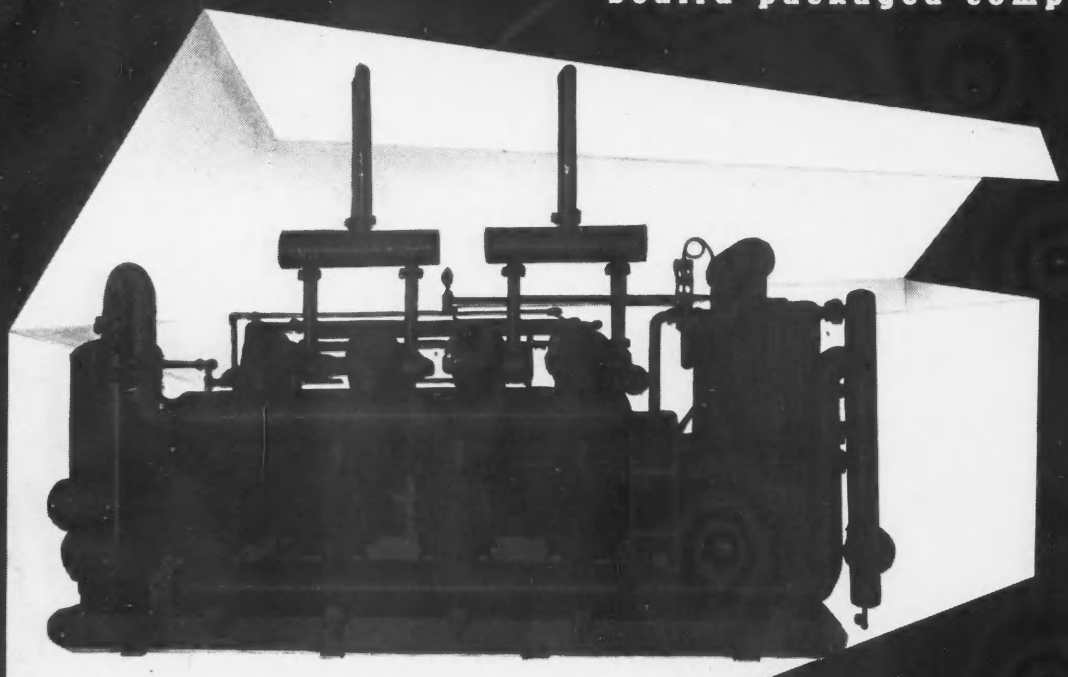

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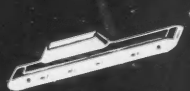
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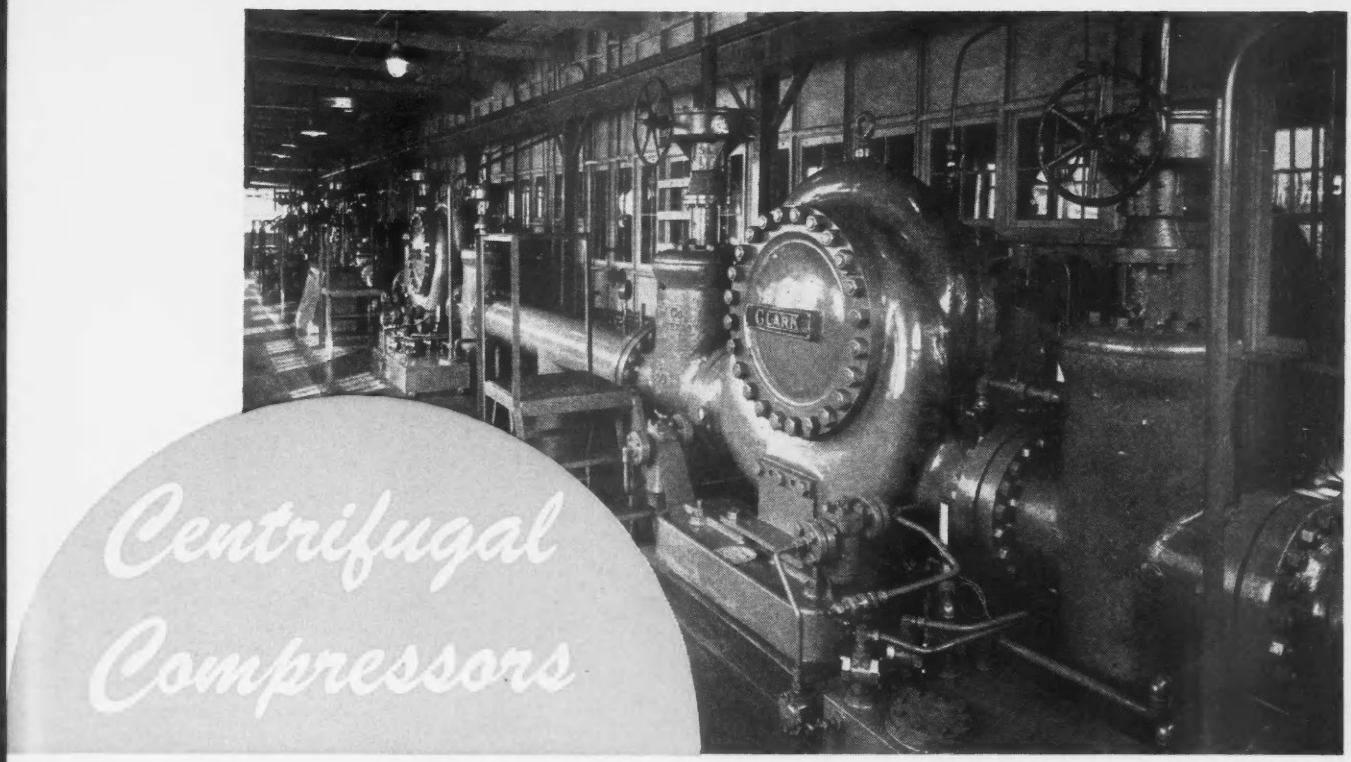

for Pipe Line Duty

By J. E. McCARTHY
Clark Bros. Company, Inc.

DETAILS ON the design of two typical "Big Inch" stations are discussed by the author, showing how characteristics and dimensions of the compressor were varied to meet exacting limitations laid down by conversion of the systems from oil to gas throughput.

THE installation of centrifugal compressors on major natural gas pipe lines within the last 1½ years has caused considerable interest to be developed in the application of this type compressor. Further interest has been aroused as the result of a very thorough paper[1] which described the particular circumstances leading to installation of centrifugals on the "Big Inch" pipe lines and the results of operation at the time of writing.

In order to cover the general subject of the use of centrifugals for gas pipe line duty, it would be necessary to make a complete study on the economics of the prime mover for a number of installations as a different conclusion will be reached for each different set of conditions. At this time, however, the data on operating units are quite meager, and the study would be based mainly on hypothetical conditions and sweeping assumptions as to the cost of power or fuel. Furthermore, the results of operation on units now under consideration would very likely nullify many conclusions reached on paper, in addition to presenting problems which had not arisen before. So the purpose of this report is to go into a little more detail on the design of the "Big Inch" centrifugals and the reasons for some of the steps that were taken.

The only stations on which we are able to report in detail are Stations 8 and 20 on the Texas Eastern Transmission Corporation pipe line, but the conditions which dictated much of the design were the same for all centrifugal stations. The arrangement of compressors in Station 20 is shown on the accompanying photograph.

Shown above is an arrangement of five centrifugal compressors in Station 20, Texas Eastern Transmission Corporation, showing manifolding and valve controls.

Five single stage pedestal type centrifugal compressors, each direct-connected to an electric motor, are operated in series to produce the over-all compression ratio. The compressors are driven through a firewall, the shaft passing through a stuffing box in the wall to reduce the fire hazard. As a further precaution, the electric motors are force ventilated.

The following are the design specifications for the compressor in Station 20, just preceding which the flow of the "Big Inch" (24-inch diameter) and "Little Big Inch" (20-inch diameter) lines are combined.

COMPRESSORS:

1. No. of Units	Five
2. Type	Single Impeller, Centrifugal Compressors
3. Impeller Diameter	32 inches

ELECTRIC MOTORS:

1. No. of Units	Five
2. Type	Squirrel Cage Induction Motors, Force Ventilated
3. Nominal Speed	3570 rpm

4. Nominal Rating, each	2000 hp

COMPRESSOR STATION:

1. Capacity	340 Mmscfd
2. Suction Pressure	471 psia
3. Discharge Pressure	726 psia
4. Over-all Compression Ratio	1.54
5. Installed Horsepower	10,000
6. Brake Horsepower	9065

Gas Capacity

The data listed show that the station will be capable of handling almost 400 Mmscfd of gas without seriously overloading the motors. Unless the inlet pressure of the gas were increased some, however, the extra capacity would cause a slight reduction in compression ratio, due to the "drooping" characteristic of centrifugal compressors.

The compressor arrangement is the same for Station 8; that is, five compressors in series, but the gas flows for the Big Inch lines are handled in parallel and there are two compressor houses, each having five compressors and five motors with a design capacity of 254 Mmscfd per line.

Different conditions existed for the electric motors in this station which caused a change in compressor design. While it had been possible to obtain 2000 horsepower motors for Station 20, Station 8 had originally been equipped with six 1250 hp motors, three on each pipe line station. So in order to compress the design capacity of gas to the required discharge pressure, it was necessary to extend the compressor house to accommodate two more compressors on each line. It was also necessary to design the impeller diameters so that each motor would be fully loaded.

The design specifications for Station 8:

COMPRESSORS:

1. No. of Units	Ten (Five on "Big Inch" and Five on "Little Big Inch" lines)
2. Type	Single Impeller Centrifugal Compressors
3. Impeller Diameters	29" (Six) 32" (Four)

ELECTRIC MOTORS:

1. No. of Units	Ten
2. Type	Squirrel Cage Induction Motors, Force Ventilated
3. Nominal Speed	3570 RPM
4. Nominal Rating	1250 HP (Six) 1500 HP (Four)

COMPRESSOR STATION:

1. Capacity	526 Mmscfd (Total)
2. Suction Pressure	508 psia
3. Discharge Pressure	770 psia
4. Over-all Compression Ratio	1.515
5. Installed Horsepower	13,500
6. Brake Horsepower	13,880

It will be noted that this station is loaded to approximately 103 percent of installed horsepower. Such a selection was justified, it was felt, as it eliminated the need for furnishing one or more oversize motors and made it possible to design a minimum number of compressor sizes.

Compressor Design

The special conditions under which the Big Inch lines were sold have been described quite fully before. Briefly, the stipulation that the lines must be converted back to operation on oil in 90 days should an emergency arise meant that no extensive changes could be made to either the electric motors, piping, or oil-pump bases. The compressor design problem was complicated by the following fixed conditions, all of which could be varied under normal procedure:

1. COMPRESSOR SPEED: Compressors are operated by constant speed motors, and it was not possible to use speed increasing gears because of the loss of efficiency and because of the space problem.

2. COMPRESSOR SIZE: The compressors had to fit on the bases which had been designed for the oil pumps and also fit between the suction and discharge pipe flanges.

3. MOTOR HORSEPOWER: The six 1250 hp motors in Station 8 had to be utilized. There was also a limitation on the size of motors available for the other stations.

4. NATURAL GAS CAPACITY: The stations had to be designed to handle a certain future design flow.

5. STATION COMPRESSION RATIO: This was fixed by station spacing and other factors pretaining to pipe line design.

At first examination the problem seemed insoluble but by adding motors to each station and designing the impeller diameter to fit each motor size, a very satisfactory solution was reached. This can best be explained by use of the two formulas used very often in connection with centrifugal equipment:

$$(1) \qquad HP = \frac{H}{33{,}000} \times \frac{W}{E}$$

in which H equals head in feet

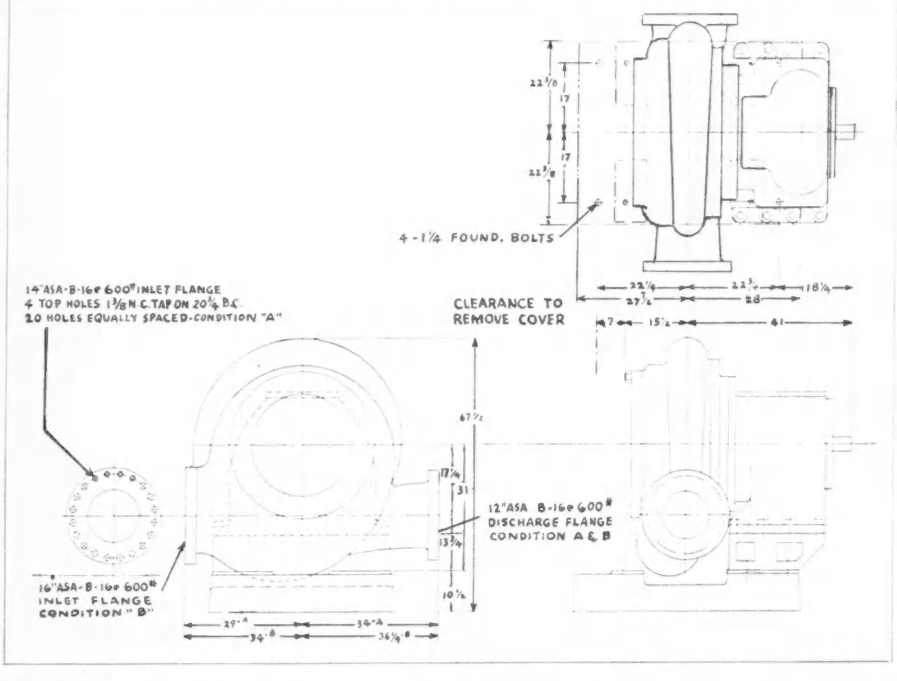
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FIGURE 1—Outlines of high-pressure centrifugal compressor as designed to replace centrifugal pumps formerly occupying same bases in stations of two "Big Inch" lines.

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W equals mass rate of flow, pounds per minute

E equals compressor efficiency

$$(2) \quad H = \text{"u"} \frac{V^2}{g}$$

in which "u" equals pressure coefficient

V equals peripheral velocity of impeller, feet per second

g equals gravitational constant, feet per second²

Station 20

A. Taking Station 20 as an illustration, three 1250 hp motors were available to begin with, having been used to drive oil pumps. Since it was desired to load the motors to full load, the available power for each of the first three stages was fixed at 1250 hp. The mass rate of flow was fixed by the design capacity of the line while the compressor efficiency could be assumed as a result of previous tests. These factors then determined the amount of head which the compressor could produce without overloading the motor.

B. By use of formula (2), the peripheral velocity of the impeller was found since the desired pressure coefficient could be assumed.

C. The remaining step consisted of finding the compressor diameter. This was done by the formula:

$$(3) \quad V = \frac{\pi DN}{720}$$

in which V equals peripheral velocity, feet per second

D equals impeller diameter, feet

N equals speed, RPM

Substitution of the motor speed then gave the required value for impeller diameter.

It was found that the head produced by the three compressors operating in series did not meet the over-all station compression ratio, so the following steps were then necessary:

A. The head corresponding to the remaining compression ratio was calculated.

B. The value of head was substituted in formula (1) which gave the remaining horsepower required. In this case, the horsepower amounted to approximately 3000, so it was decided to use two 1500 hp motors for each line.

C. Division of the total head into the two remaining compressors gave a value which could be used in equation (2), giving peripheral velocity.

D. The impeller diameter was determined by equation (3) as before. This amounted to two 32 inch diameter impellers on the two extra stages as compared to 29 inch diameters for use with the three 1250 hp motors.

Compressor Construction

The compressor casing was made of the single volute type for the following reasons:

1. The casing could be cast in single piece, eliminating any possibili of gas leakage through a horizont split.

2. By means of the overhung co struction, sealing was necessary at onl one point, i.e., between the impeller an the bearing pedestal. This reduced th amount of sealing oil, piping, an maintenance which might be necessar

3. It was possible to accommoda the compressor within the limitations flange spacing and base dimensions.

Figure 1, which shows the outline d mensions of a high pressure centrifug compressor, points out that such a un occupies a floor space of 29 square fe and is 67 inches high. Such a compress designed for capacities requiring much as 6000 hp weighs about 10,0 pounds. In other words, if full hors power were required, the space requir ments would amount to 200 hp p square foot floor area and the un would weigh only 1.7 pounds per hors power.

A sectional view of the high-pressu pedestal compressor is presented her This view shows the main componen of the compressor, i.e., overhung casin impeller, high-pressure oil seal, an bearing pedestal.

Sealing of the high-pressure gas accomplished by the self-aligning pre sure oil sleeve type seal mounted i board of the impeller. The oil is fu nished by a separate motor-driven ge type pump which maintains a certa differential of oil over gas pressure. the event of power failure, an oil storag tank above the compressor which connected on top to the high pressu gas, forces oil down to the seal until t suction and discharge valves to the co pressor can be closed.

Since a clearance is maintained b tween the impeller and compressor ca ing, the only wearing parts of t machine are the oil seal, journal bearin and thrust bearing. With reasonab care being taken that the lubrication these items is maintained, the init operating efficiency of the compress may be maintained over its entire life

Operating Characteristics

The characteristics of a centrifug compressor are almost identical w those of a centrifugal pump. In fact, t only salient differences in operation a the rise in temperature and reduction volume which accompany gas compr sion. The variation of horsepower a discharge pressure with suction volu is shown in Figure 2, plotted with spe

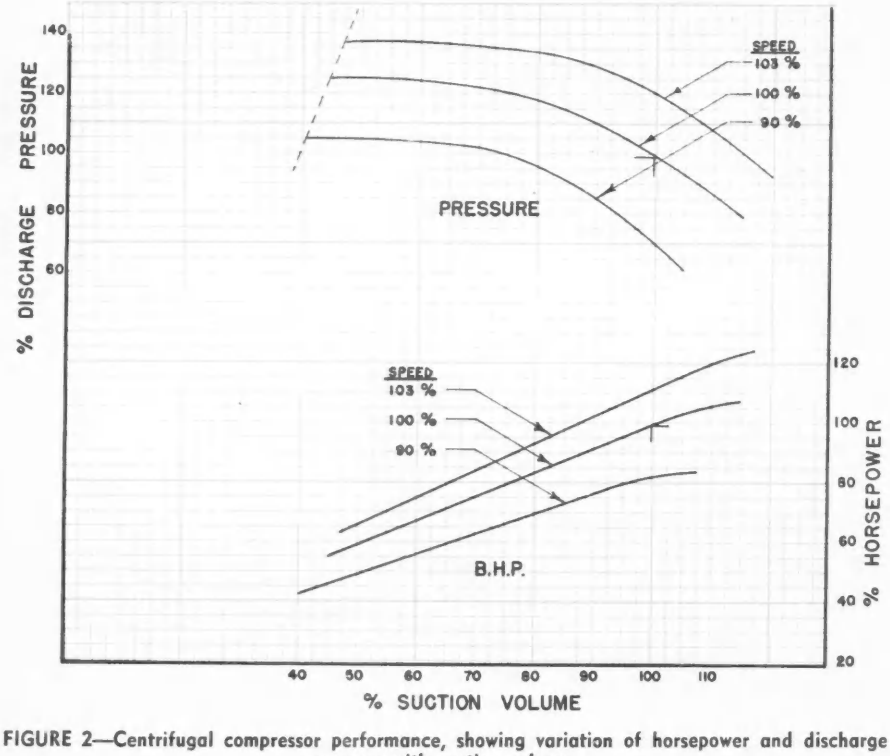

FIGURE 2—Centrifugal compressor performance, showing variation of horsepower and discharge pressure with suction volume.

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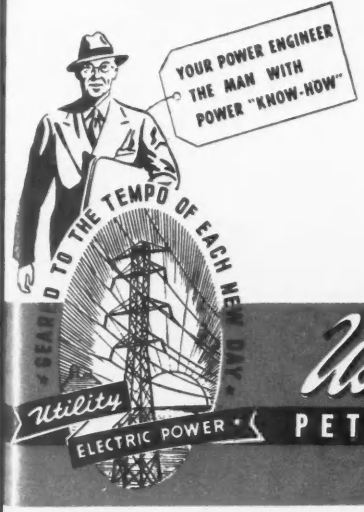

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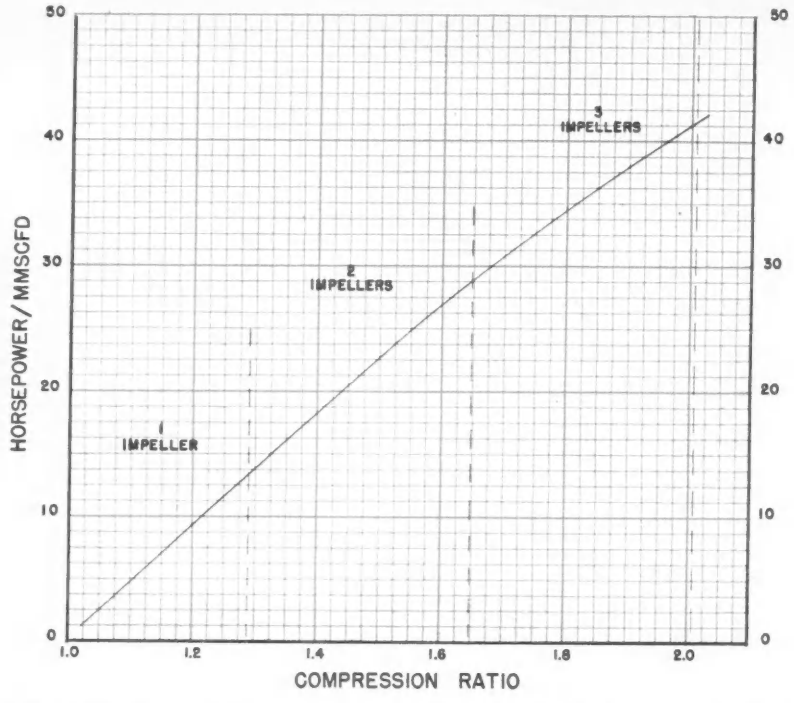


FIGURE 3—Variation of horsepower with compression ratio for centrifugal gas compression on natural gas, having S.G. equals 0.6, T_1 of 60° F., C_p/C_v equals 1.27, and P_d of 750 psig.

as a parameter. These curves are based on "backward bending" impeller vanes as opposed to radial or "forward bending" vanes, and illustrate the non-overloading characteristic of this type of impeller. Loading above 120 percent of normal capacity would cause the pressure to drop to zero, thus unloading the driver, an important characteristic when using electric drive.

Optimum Compression Ratio

One problem worth mentioning with regard to the use of centrifugal compressors on pipe line duty is the optimum compression ratio at which they should operate. Design compression ratio[2] is based on many factors, such as:

1. The power necessary to compress a standard volume of gas.

2. The manner in which the power changes with compression ratio.

3. The change in compressibility of the gas with operating pressure.

It is not the purpose of this paper to discuss pipe line design in great detail, as this is a very complex problem about which much has been written; but the variation of horsepower requirements with compression ratio can be shown for a typical centrifugal compressor application.

The horsepower per Mmscfd is shown in Figure 3 for compression ratios between 1.0 and 2.0, along with the number of impellers required for each range of ratios. This curve shows that hp per million for a ratio of 1.15 is only 7.3 as compared to a value of 41.3 for a ratio of 2.0. In other words, only 17.7 percent of the higher power is required at the low compression ratio. Against this obvious saving in compressor cost must be weighed the increased compressor station cost, extra maintenance, and other expenses caused by the increased number of stations. The main point which the curve brings out is that centrifugal compressors will operate efficiently at low compression ratios if a low pressure ratio per station can be economically justified.

Stability

When suction volume is reduced to approximately 40 percent of normal at any one speed, the compressor will go into "surge," an alternating discharge and reversal of flow which set up pulsations in the compressor very similar to the phenomenon occurring with centrifugal pumps. This condition is not to serious, but operation in the surge rang for any extended period is not recom mended. The design of compressor mus take into account a compromise betwee stability (non-surging limit of oper ation) and operating efficiency as max mum efficiency is reached at approx mately 80 percent of design flow. Thi means that the compressor will operat near maximum efficiency over quite wide range of capacity. If it appear likely, however, that the volume woul drop much below 50 percent normal f long periods, the compressor may b designed for 105 percent to 110 percen of normal. This will allow operation a reduced volumes with only a slight de crease in efficiency.

Summary

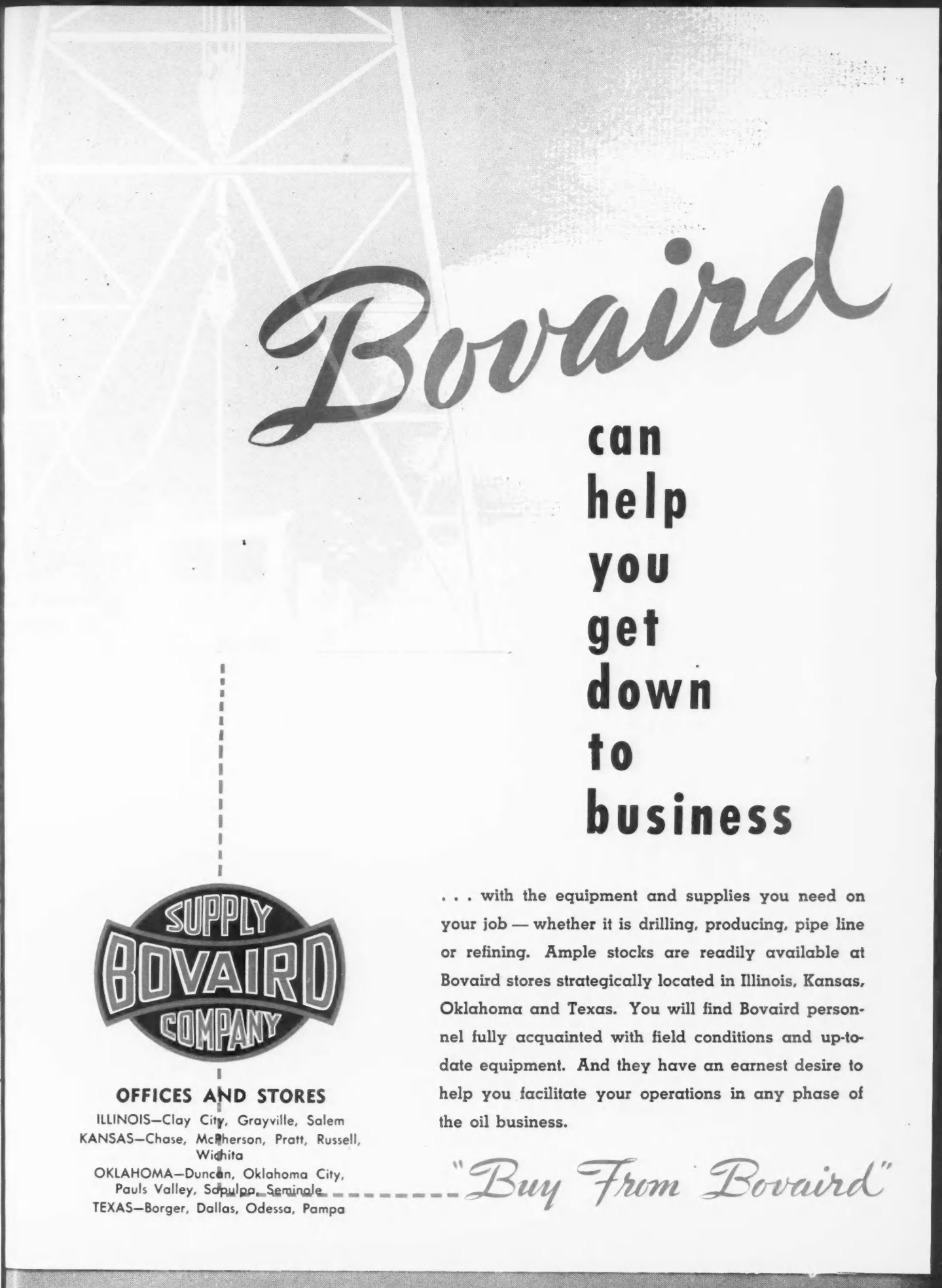
The operation of centrifugal compres sors on the Texas Eastern Transmissio pipe lines has been satisfactory in man ways. Not only did the compressor prove to be versatile enough to b adapted to a rigid set of conditions, bu the results have shown that the line ca operate at high load factors over lon periods of time. As previously pointe out, an economical prime mover mus be available before the use of centrifuga compressors can be justified. Since thi type of compressor is now available, it advantages can be weighed with thos of the reciprocating compressor for eac new installation. The choice between th two will be determined by such factor as first cost, operating cost, reliabilit efficiency, and the required operatin conditions. It is axiomatic that neithe type of compressor will replace th other since each has characteristic suited for a particular job. In a grea many cases, however, the choice o compressor will be hard to make an an evaluation will have to include careful study of all factors.

REFERENCES

[1] Goodrich, B. D. The Application of Centri ugal Compressors to High-Pressure Ga Transmission. A.G.A. Spring Meeting, 1948.
[2] High Pressure Pipeline Research. Cla Bros. Co., Inc., Olean, N. Y.

About the Author

J. E. McCARTHY served two years with the U. S. Navy as an ordnance officer, after being graduated from Cornell University in 1944 with a degree in mechanical engineering. Since leaving the Navy, he has been employed by Clark Bros. Company, Inc., as an application engineer in the Turbo-Machinery division.



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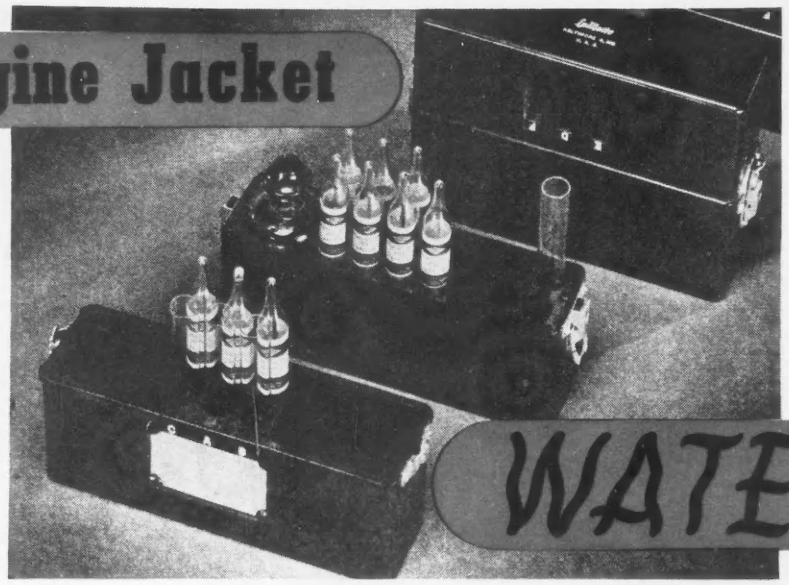


Plastic block comparator for determining pH of water.
Photo Courtesy LaMotte Chemical Products Company

A PRIME factor in the efficient and economical operation of water-cooled engines, whether of the opened or closed type system, is the use of properly conditioned water. Station engineers and others working in the engine house cannot be too careful in the use of water in the engine jacket, which latter is subject to corrosion and scaling. Carelessness in this aspect of engine maintenance and care can cause the loss of a heat exchanger bundle or other parts from corrosion, or a cylinder head or liner from scale.

Waters encountered are so varied and the problems in their use so multitudinous that the writer does not presume to cover in this brief article all conditions which may be encountered. However, for the benefit of superintendents and field men, the following information, although fundamental, sets forth certain basic principles and instructions which, if studied and carried out will assist station men to a better understanding of water problems and treatment and save their companies time and money by reducing engine repair and replacement hazards.

Engine jacket water systems fall into two classifications: (1) closed, using heat exchangers or other medium to cool the water; and (2) open, using large volumes of water and cooling by circulation and/or spraying.

There are two problems involved in the treatment of this jacket water: (1) corrosion, and (2) scale formation. Both are rarely encountered in the same system because corrosion can result only from acidity or dissolved oxygen in the water and acids can contain no scale forming solids. This means that if both are encountered in the same system the corrosion is the result of dissolved oxygen and can be eliminated by releasing entrained air and the use of sodium chromate.

These subjects—acidity, oxygen concentrations, and the formation of scale —will be covered separately as related to closed cooling systems, as they may be considered separate and distinct problems.

Acidity (pH Control)

There are many acids, ranging from boric acid which is used as an eye wash, to the strong acids like sulfuric, which will dissolve iron almost as readily as water will dissolve sugar. All of these owe their acidity to the single property of producing hydrogen ions in solution. Hydrogen ions are atoms of hydrogen carrying a positive charge. Strong acids produce high concentrations of hydrogen ions and vice versa.

Pure distilled water contains one gram of hydrogen ions per 10 million litres of water. This may be written one gram of H per 10^7 litres of water, and the figure "7" is used as the pH (hydrogen potential) of pure distilled water. If water contains one gram of hydrogen ions per 100,000 (10^5) litres of water the pH is "5" and the water is acid and highly corrosive.

The various alkalis such as soda ash, lime, etc., owe their alkalinity to the hydroxyl ions (OH) which they produce in solution. As previously stated, 10 million (10^7) litres of pure distilled water carries one gram of positively charged ions of hydrogen, which charges are balanced by an equal quantity of negatively charged hydroxyl ions. Thus the water is neutral (neither acid nor alkaline) and the total pH reading of the hydrogen (H) and hydroxyl (OH) ions is 14. For simplification, instead of using a pH scale from 0 to 7 and a pOH scale from 7 to 14, pH is indicated by the entire scale from 0 to 14, the pH readings from 0 to 7 indicating acidity and those above 7 indicating alkalinity.

To avoid corrosive action the pH of all engine jacket water must be kept above 7 and should be kept between 7.5 and 8. Water with a pH of 8 does not usually carry enough scale forming solids to cause scale deposits but does insure freedom from corrosion due to acidity.

The pH of water is determined in the field by titrating with a phenol red block comparator as follows:

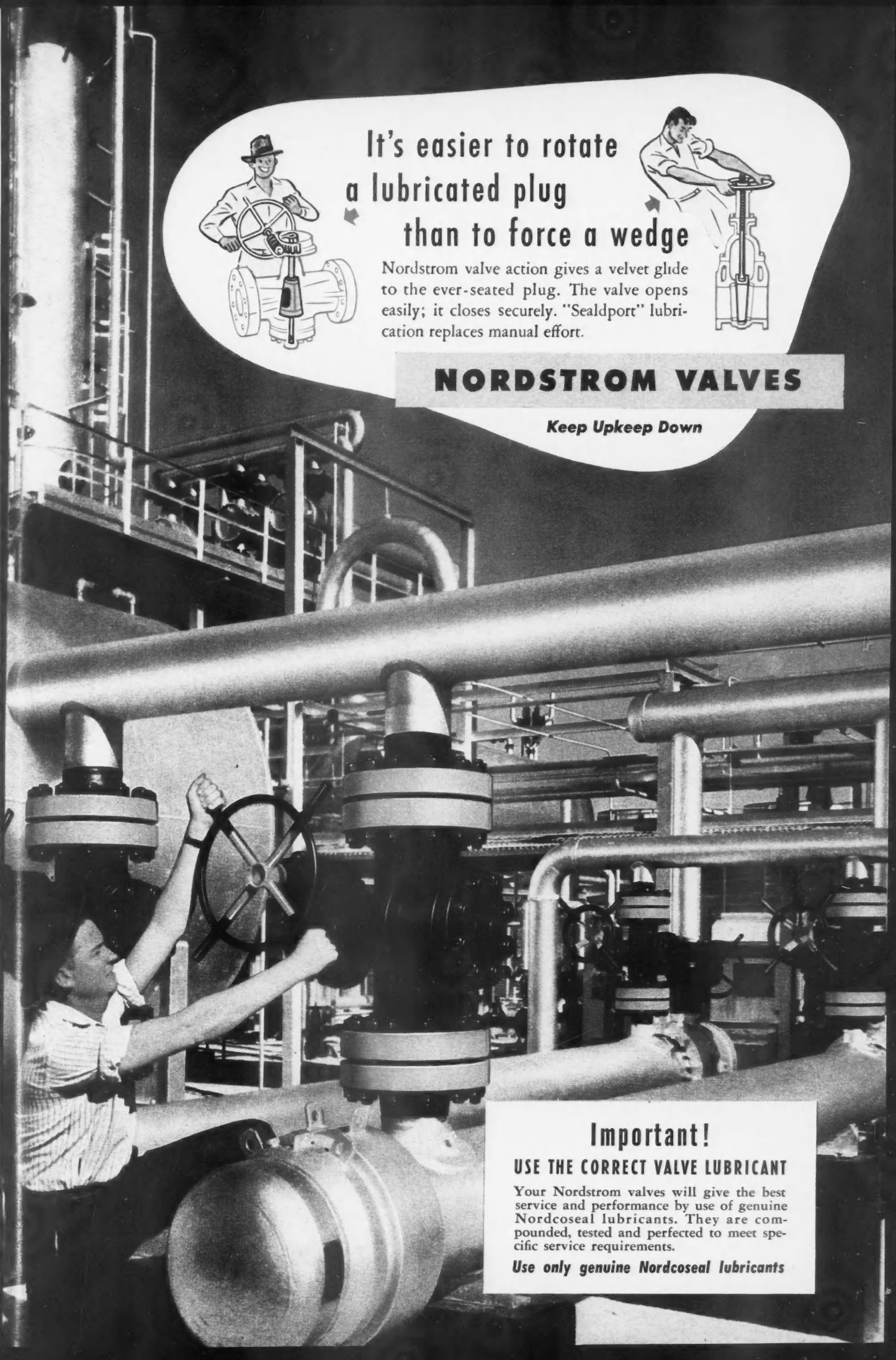
1. Fill three of the graduated test tubes to the mark (10cc) with the water to be tested and place in holes marked B, A, and C.

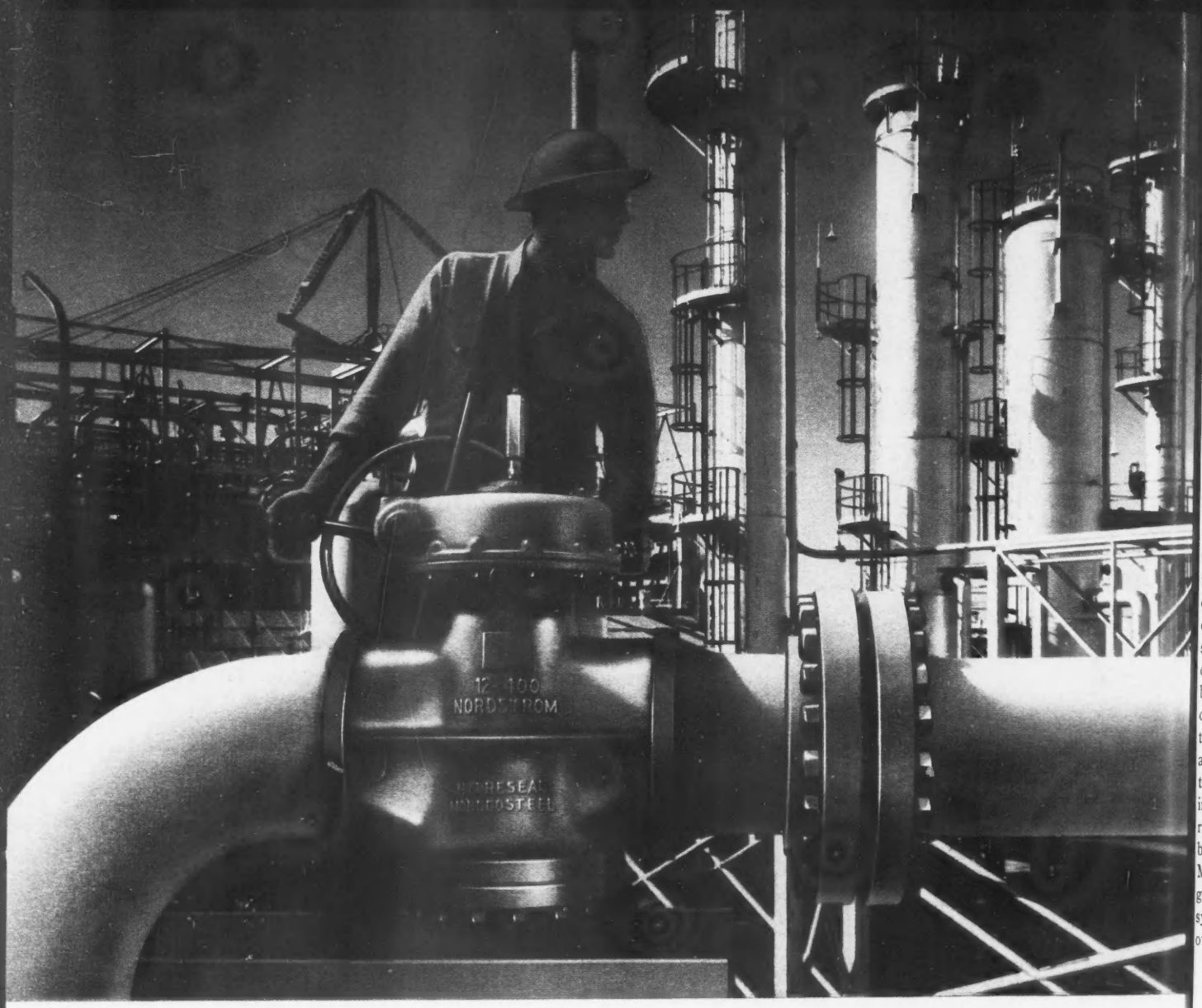
2. To the middle tube (A) add 0.5cc of phenol red indicator solution from the bottle by means of the graduated pipette and nipple, and shake thoroughly.

3. Place the tube of distilled water in the hole marked D and two of the color standards differing by only 0.2 pH (for example 7.8 and 8) in the two holes E and F.

4. Look through the three pairs of tubes holding them toward a window or other source of daylight and change the color standards, if necessary, until the center pair of tubes exactly matches one of the other pairs, or until the color through the center pair lies between the colors of the pairs on either side. Always make sure that the standards placed on either side of the ampule of distilled water differ by only 0.2 pH as outlined in item 3.

5. If an exact match is obtained the pH is read directly from the color stand

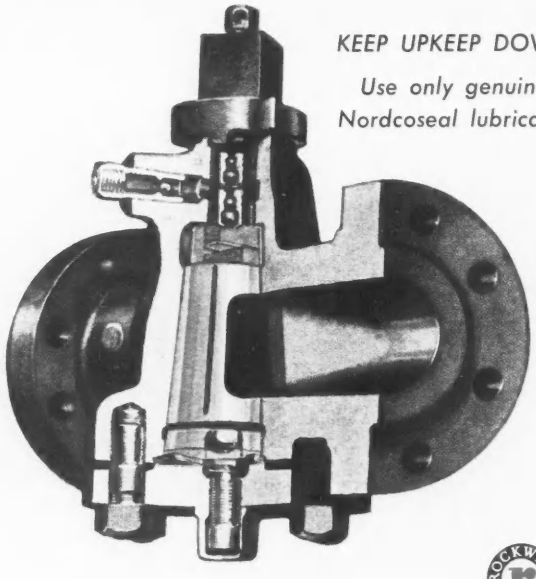

It's easier to rotate
a lubricated plug
than to force a wedge
Nordstrom valve action gives a velvet glide to the ever-seated plug. The valve opens easily; it closes securely. "Sealdport" lubrication replaces manual effort.
NORDSTROM VALVES
Keep Upkeep Down
Important!
USE THE CORRECT VALVE LUBRICANT
Your Nordstrom valves will give the best service and performance by use of genuine Nordcoseal lubricants. They are compounded, tested and perfected to meet specific service requirements.
Use only genuine Nordcoseal lubricants



Prevent costly shutdowns due to valve failures

—SPECIFY NORDSTROMS

Plants keyed to high efficiency, with investment of millions of dollars, must have the best valve protection. For instance, overhead and operation of a $5,000,000 plant can easily run $5000 per day—$200 per hour. Merely a 4-hour shutdown due to a valve failure can cost $800 or more plus valve replacement. But when your plant lines are controlled with Nordstrom lubricated valves, you avoid the hazard of valve failure and the cost of frequent replacement. Investment-wise, Nordstroms cost less than any other valves in terms of *service* and longer life.



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Use only genuine Nordcoseal lubricants

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NORDSTROM VALVE DIVISION

Rockwell Manufacturing Co.

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ard with which the match was obtained. If the color of the center pair of tubes lies between the colors of the pairs on either side the pH value is taken as an average of the two. For example, if it lies between 7.8 and 8 it is considered 7.9 pH.

6. A reading at either end of the scale cannot be considered accurate but will show that the water is far beyond the range required. If it is acid it will require addition of lime or soda ash and a re-check before adding sodium chromate. If it is above 8.4 pH the water sample should be further analyzed.

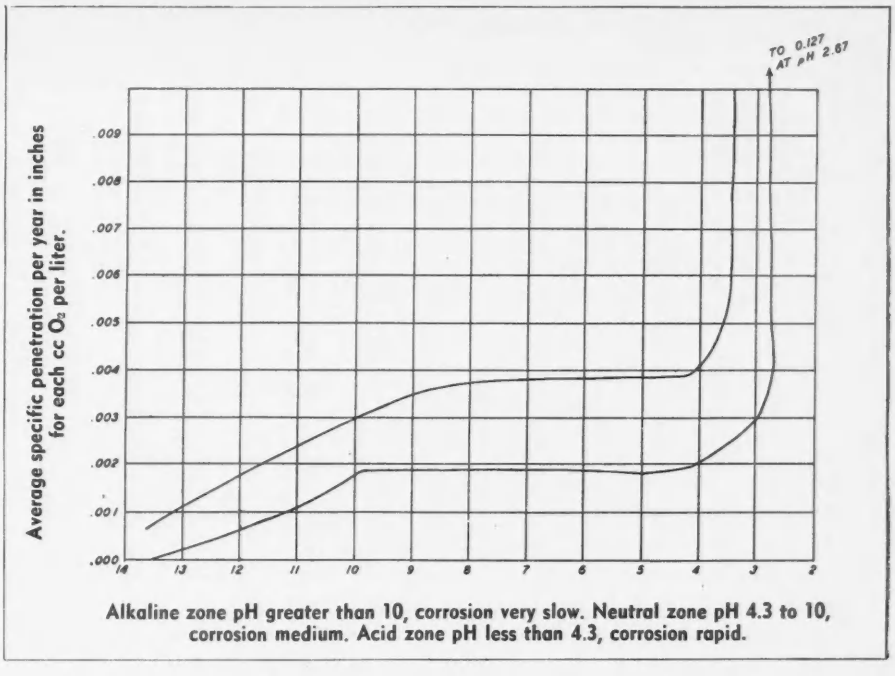
It is important that make-up water in the reservoir be treated to correct the pH reading and kept between 7.5 and 8. Before treating the reservoir an analysis should be made of the water to determine whether lime or soda ash is required to increase the pH. If the water contains sulfates, soda ash or caustic soda should be used, and if it contains carbonates, then hydrated lime should be added. The lime will tend to settle out carbonates and the soda ash will tend to settle out sulfates. A practical and effective method to add either material to the make-up water is to place in a burlap bag and drag through the reservoir until enough is dissolved to bring the pH up to between 7.5 and 8. Make-up water with a pH above 8.4 is generally satisfactory in closed cooling systems if there is little evaporation or other losses.

Oxygen Concentration

Oxygen and water alone will cause corrosion even in alkaline solutions (pH above 7), although the corrosion rate is accelerated as the acidity increases. Figure 1 shows the effect of oxygen concentrations on the corrosion rate for solutions ranging from highly acid to highly alkaline.

Figure 1 shows the importance of designing cooling systems to prevent air entrainment, which can be prevented by the installation of vent boxes to release air. The addition of 0.025 percent to 0.035 percent by weight of sodium chromate to engine jacket water will inhibit corrosion by reducing the ability of the water to hold oxygen. To obtain the quantity of sodium chromate required multiply the number of gallons of water in the system by 8.33 (weight of water in pounds per gallon) and then multiply the result by 0.00035 (for 0.035 percent). The result will be pounds of sodium chromate required.

The chromate strength of jacket water is determined by the use of a color comparator similar to that used for pH determination. A sample of the sodium chromate treated water is placed in a test tube and two color standards placed



Alkaline zone pH greater than 10, corrosion very slow. Neutral zone pH 4.3 to 10, corrosion medium. Acid zone pH less than 4.3, corrosion rapid.

on either side and viewed through the comparator with the blue glass toward the observer and the comparator held to a window or other source of daylight. When a matched sample is obtained the chromate strength is read directly from the label on the color standard or found to be between two standards. Samples below 0.025 percent do not show enough sodium chromate to insure that no corrosion will occur and samples above 0.035 percent show that sodium chromate is being wasted.

From the above it is evident that if the pH of the make-up water used in closed cooling systems is kept between 7.5 and 8, and the chromate strength of the jacket water is kept from 0.025 percent to 0.035 percent, corrosion is almost impossible and scale formation will be negligible because of the low concentrations of scale forming solids and small quantities of make-up water that are required.

Scale Formation

This is the prime source of trouble in open water systems and is rarely a problem in closed cooling systems because evaporation is reduced to a minimum, thus eliminating concentration of scale-forming solids. This reduces the make-up water requirements to the extent that rain water can be used almost exclusively for this purpose. Use of the proper chemicals in pH control is usually effective in scale prevention, and if scale is found in engine jackets, corrective measures should be inaugurated immediately. Raw water should never be circulated through closed cooling systems for additional cooling or to keep the system full as this procedure will deposit scale. All of the water in the entire system should be dumped once each year, however, to remove any concentration of solids or sludge.

The insulating properties of scale are not generally realized but can be illustrated by a few examples. Cylinder heads and liners that must transmit heat from the combustion chamber to the jacket water are rarely more than one inch thick, but one-sixteenth inch of calcium carbonate scale on this one-inch thick metal reduces the heat transfer to an equivalent of 4¼ inches of metal. If the same thickness of scale is of the silicate type (hard, compact and glassy) it is equal to a liner 14⅞ inches thick. In other words, scale of different types is from 52 to 220 times as effective in preventing proper heat transfer as the cast iron. From the above it is evident that even one thirty-second of an inch of scale should be avoided as that is the equivalent of from 1½ inches to seven inches of cast iron.

Causes of scale formation other than carbonates and silicates are oil deposits, organic deposits (algae, etc.), and iron oxide (rust). The latter can be eliminated by corrosion control methods previously outlined, and oil deposits can be eliminated by preventing and stopping leaks of oil into the water system. Algae, if present in sufficient quantities to cause trouble, should be eliminated by the use of sodium hypochlorite in the proportions of one pound per 40,000 gallons of water in the system. It can be introduced in the same manner as previously described for soda ash or lime treatment. Sodium hypochlorite is an acid and will tend to lower the pH, making necessary the use of additional quantities of soda ash or lime.

Barrett

PROTECTION SERVICE

Covers Every Pipe-coating Need

Materials and Application Procedure for:

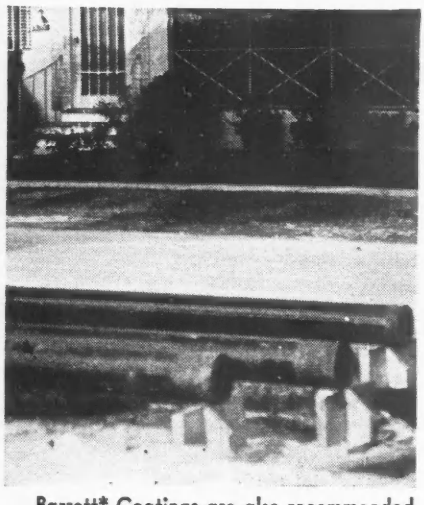
1. Water Industries
2. Natural Gas, Crude Oils and Products Transmission
3. Professional Application in Plants and Yards
4. Distribution Systems
5. Reconditioning Operations
6. Gathering Systems
7. Recycling Operations

Materials and Application Procedure for

DISTRIBUTION SYSTEMS

Because of the high cost of distribution pipelines, their relative inaccessibility for repair, and the inherent possibility of leak hazards, it is imperative that only the finest coatings be used for their protection. Barrett* Enamels are ideal for such use.

Their great flexibility and ductility enable them to withstand the flexing of the pipe. They also resist wide extremes of heat and cold without cracking. This latter quality is highly important when pre-coated pipe is bought and stored on skids until needed. The Barrett organization will be glad to confer with you on any of your pipe coating problems.



Barrett* Coatings are also recommended for protecting joints after sections of the pipe have been welded together.

THE BARRETT DIVISION
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Barrett*

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The Bird Air Detector

By E. D. NUTTALL
Research Department,
United Gas Pipe Line Company

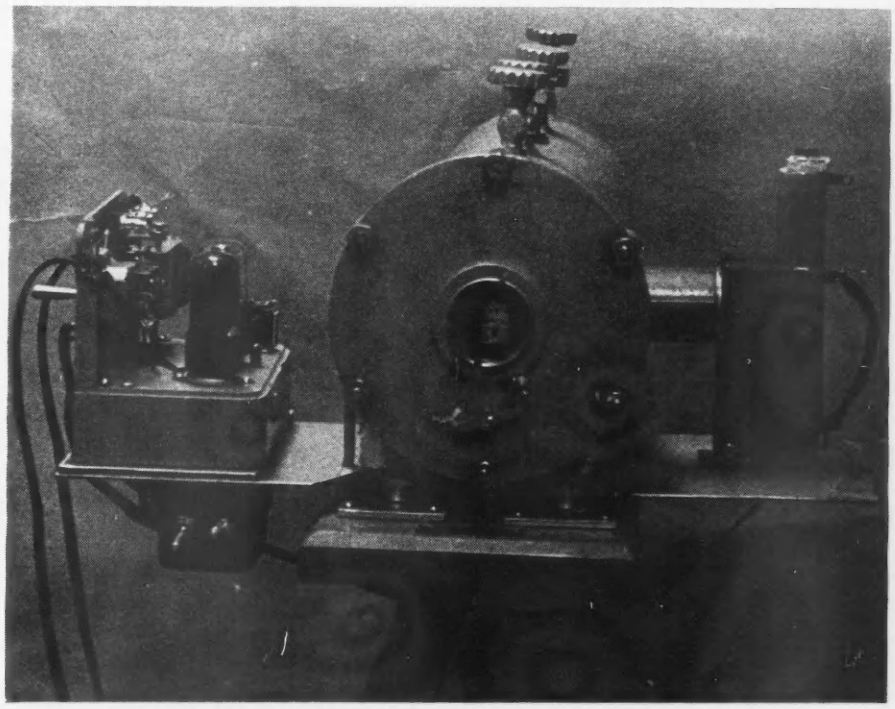

FIGURE 1. Front view of the improved Bird Air Detector. Light source is mounted at the right of an AC-ME gravity balance, while the photoelectric relay unit is shown at left.

THE Bird air detector, developed by J. R. Bird of the United Gas Pipe Line Company's Measurement department and later modified by the company's Research department, presents a new and ingenious use for the reliable AC-ME gravity balance, and at the same time provides a fast and dependable method for detecting predetermined amounts of unwanted air which may get into a gas stream. This detector probably will find its field of greatest utility in areas where gas well pressures have declined and field compressor units are necessary, and where such units may pull a partial vacuum on a line. Under these conditions a small leak would permit air to enter the system in undesirable amounts. The apparatus could be adapted to detect any gas in another gas provided the two have specific gravities sufficiently different to cause detector action.

AN INGENIOUS method has been devised not only to detect the presence of a predetermined amount of air (or another gas of different specific gravity) in a gas pipe line, but also to operate a solenoid valve which controls the flow of gas in the line. The detector is especially adapted to use in areas where gas well pressures have dropped to the point where field compressors are required, and where, therefore, there is the possibility of partial line vacuum and attendant dilution with air in case of small, undetected leaks. Sufficient data are presented to permit the reader to construct a similar air detector for his own use.

Gravity Balance

The Bird air detector is essentially an AC-ME gravity balance in which an additional window has been mounted on each side of the cylinder. A photoelectric light source is mounted on one side of the gravity-balance cylinder in such a manner that the light beam can be directed through the cylinder and the two windows mentioned above to a photoelectric relay unit mounted on the opposite side of the cylinder. Figure 1 shows the complete unit with the cover removed from the photoelectric relay. The electrical control circuits in this photoelectric relay operate a solenoid valve which, in turn, operates other valves. The control functions are actuated by a target attached to the gravity balance arm in such a manner as to cut the light beam passing through the cylinder at a predetermined setting. This may be best illustrated by a description of the final test made when placing the instrument in service.

The instrument was balanced with a flowing sample of gas from the field which had a specific gravity of 0.786. The balance adjustment gave a scale reading of —7 millimeters. A prepared sample of gas of specific gravity 0.844 (representing normal 0.786 gas with 27 percent air in the mixture) was passed through the instrument and in 70 seconds the balance mechanism caused the solenoid valve to operate. The scale reading at this time was —3.5 mm, the 3.5 mm movement of the balance arm representing an 0.058 change in specific gravity. Normal 0.786 gas was again passed through the balance, and after a

period of stabilization the scale reading returned to —7 mm. A different sample of 0.812 specific gravity (representing 0.786 gas with 12 percent air) was passed through the instrument. The balance mechanism moved to a scale reading of —5.5 mm. This was not sufficient deviation to cause the balance target to interrupt the light beam.

From the description one can readily see how this air detector can become a reliable watch dog for a gas gathering system which may operate under a partial vacuum.

For the person who may wish to duplicate this instrument the following data may be of interest. (See Figure 2.)

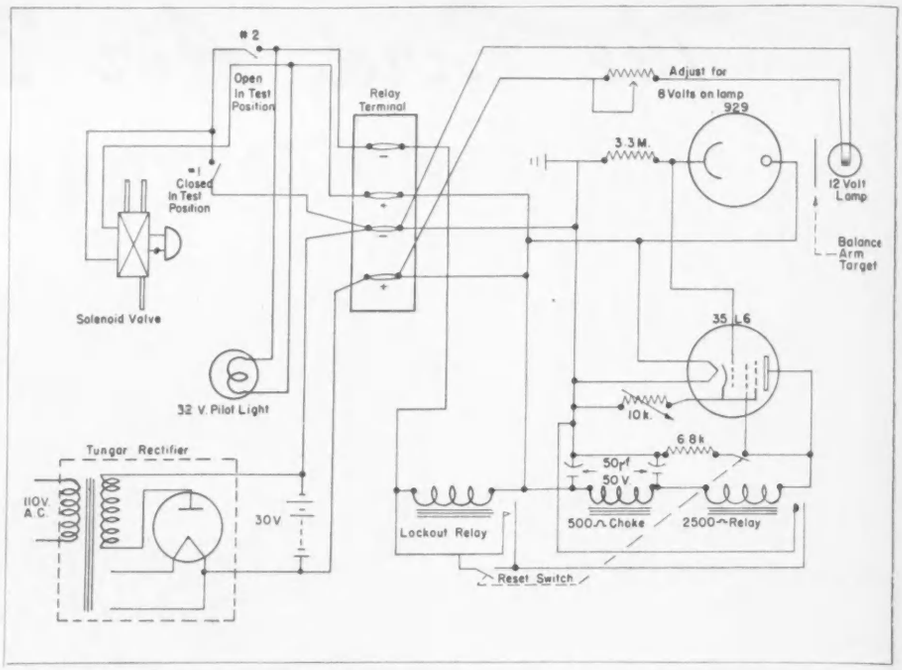

FIGURE 2. Circuit diagram of the Bird Air Detector photoelectric relay unit and light source.

Battery Operation

Battery operation of the detector is essential to insure uninterrupted service. The battery should have sufficient capacity to provide several hours of operation in the event of a power line failure. After a series of tests, 30 volts was decided upon as being a satisfactory operating voltage. Five 100 ampere-hour, six-volt automobile batteries are used. These batteries are floated across the output of a Tungar rectifier which is adjusted to take care of the normal detector load and provide a small floating charge for the battery. A 12-volt aviation type lamp, operated at eight volts through a series resistor, is the light source. This undervoltage provides exceptionally long lamp life. Small holes are drilled at the bottom and top of the lamp housing to provide air circulation for cooling the lamp. The window on the relay side of the cylinder is partially blanked out by an aluminum disc in which a slit is cut to provide a properly placed narrow beam of light on the photo-tube target and to provide a positive light cut-off when the balance arm comes down to cut the light beam. A triode connected 35L6 tube is used as the relay tube. The operating point of this tube is not critical. The 10,000-ohm adjustable resistor in the cathode circuit is used to set the operating point. The twin-relay electrical lockout circuit shown in the diagram is not essential. A single relay of the mechanical lockout type can be substituted, and may be more readily obtainable.

Positive Bias

In operation, the electron flow from the photocell target through the 3.3 megohm resistor to the common negative terminal, caused by the light beam striking the photocell target, places a positive bias on the number 1 grid of the 35L6 tube. The relay in the plate circuit of this tube thus is held in an energized position. When a change in the specific gravity of the gas causes the balance arm to move downward far enough to cut off the light beam from the photocell target, this positive bias is no longer maintained on the grid of the 35L6 tube, and the relay in the plate circuit de-energizes, closing the contacts which operate the solenoid control valve.

The rest of the schematic diagram is self-explanatory. The 32-volt pilot lamp and the No. 1 and No. 2 test switches, while optional, provide a satisfactory test circuit whereby all operational functions of the oxygen detector may be tested periodically.

Upon a request addressed to P. O. Box 1407, Shreveport, La., the writer will be glad to send a copy of the operating and testing instructions used with this instrument to any one who may wish to use them as a guide for operating a similar unit.

LaMOTTE CORROSION CONTROL

To check corrosion . . .

eliminate acidity and excess oxygen in engine jacket water.

The water should be kept at the proper pH value, and of the proper chromate strength. Periodic checking of the water for these safe values can be accomplished accurately and easily by use of the following LaMotte equipment:

FOR pH CONTROL (ACIDITY)

LaMotte Phenol Red Block Comparator
pH range 6.8-8.4 ..... $15.00

FOR CHROMATE CONTROL

LaMotte Chromate Comparator
range 0.015%-0.055% $8.40

LaMotte Chemical Products Company

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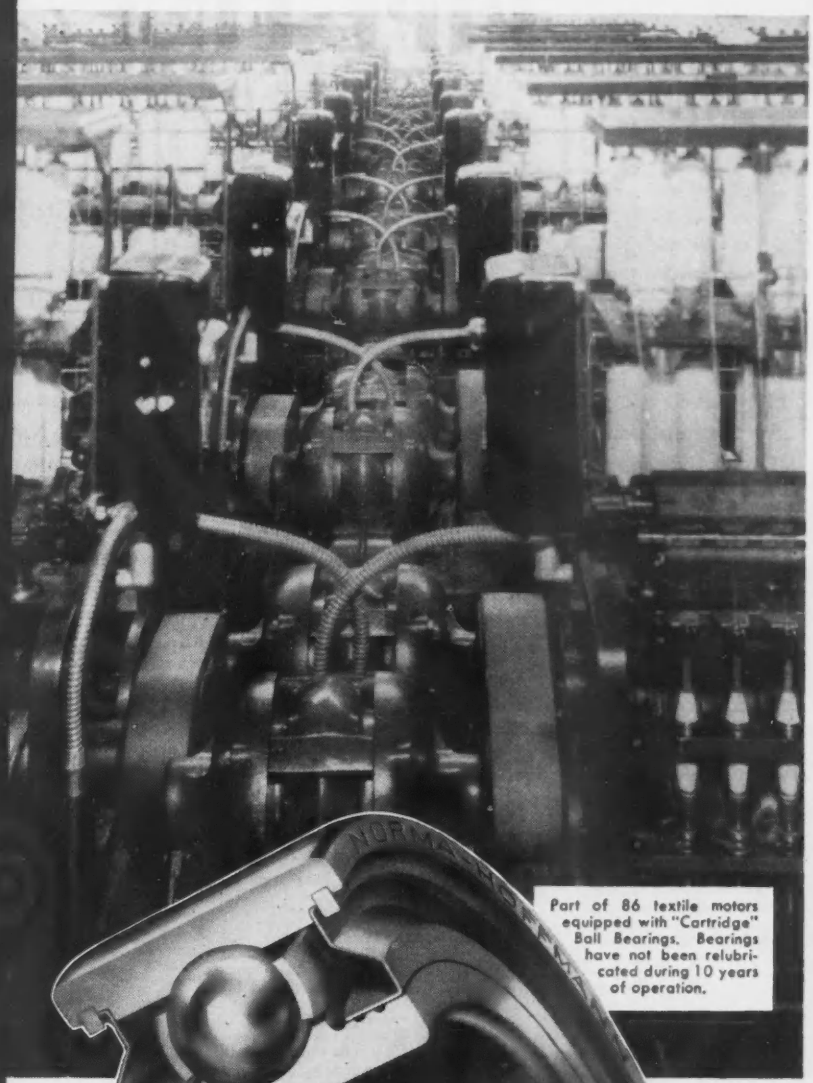
CASE HISTORY #819

646 Motors Operate 8 to 10 Years Without Relubrication or Bearing Failures ...and they're still going strong



Part of 86 textile motors equipped with "Cartridge" Ball Bearings. Bearings have not been relubricated during 10 years of operation.

Norma-Hoffmann

Patented "Cartridge" Bearings increase the "Life-Span" of Equipment

Records prove that Norma-Hoffmann "Cartridge" ball bearings give continuous performance in hundreds of applications without failure.

For example — 646 motors in 5 textile mills have been operating practically continuously for 8 to 10 years without relubrication. On inspection of many of the motors, the bearings showed no appreciable wear and the original grease was in good condition for many more years of operation.

Made to double-row width, Norma-Hoffmann "Cartridge" bearings have 100% more grease capacity than conventional width sealed bearings. The highly efficient seals keep dirt out, grease in. Factory-packed with Norma-Hoffmann's specially compounded "stability-tested" grease . . . grease that is highly resistant to oxidation and breakdown . . . assures dependable operation for long periods without regreasing.

Investigate the "Cartridge" ball bearing for your products whether they be motors, machine tools, pumps or other machinery. Our engineers are always available for consultation about your bearing applications. Write for their services.

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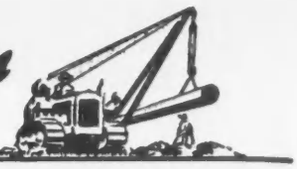
PIPE LINE *Construction*



By CECIL SMITH, Staff Writer

THE gigantic expansion program in the natural gas pipe line industry has pushed line construction activity to the highest level in history.

At the mid-point of the year there were 11,100 miles of oil, gas, and product lines being laid or that had received Federal Power Commission authorization. In addition, almost 18,900 miles of lines had been announced or were awaiting FPC action. Not included were more than 3500 miles that had been placed in operation since the first of the year.

Natural gas lines are dominating this activity with 10,150 miles under way or authorized and 13,500 miles just announced or awaiting governmental approval.

Pipe Line Construction

Table includes projects planned, contracts awarded, and spreads or entire projects completed since the last issue of WORLD OIL

COMPANY	Origin and Terminus	Length (Miles)	Pipe Size (Inches)	Daily Capacity (Barrels Cu. Ft.)	REMARKS
CRUDE OIL LINES					
Humble Pipe Line Company	Kemper, Reagan Co., W. Tex., to Satsuma, Harris Co., U. Tex. Coast	375	18	95,000	Construction on this recently announced line is scheduled to begin late in 1949. One pump station is planned, another would raise capacity to 120,000 bbls. Cost will be $18 million.
Magnolia Petroleum Company	Gathering System in Duncan, Okla., vicinity	22	2 to 24	.....	C. P. Carter Construction Co., Duncan, started Aug. 1.
Mid-Continent Pipe Line Company	Mounds to Sapulpa, Okla. Sapulpa to Tulsa	10 9	10 8	30,000	C. P. Carter Constr. Co. completed 10-in July 25 and started 8-in July 25.
Mid-Valley Pipe Line Company	Longview, E. Texas to Lima, Ohio	1000	20 & 22	150,000	Contracts awarded as follows:
	Sect. 1-Longview to Haynesville, La.	.....	.....	.....	Will not be awarded until 1950.
	Sect. 2-Haynesville to Mayersville, Miss	120	20	.....	Latex Constr. Co., Houston, to start in Sept.
	Sect. 3-A-Mayersville to near Oakland, Miss	111	22	.....	Associated P. L. Contractors, Inc., Houston to Start in December.
	Sect. 3-B & 4-A-Oakland to Henderson, Tenn.	111	22	.....	Eastern Constr. Co., Dallas. To start in Dec.
	Sect. 4-B & 5-A-Henderson to Clarksville, Tenn.	111	22	.....	Eastern Constr. Co., Dallas. To start in Dec.
	Sect. 5-B & 6-A Clarksville to Elizabeth, Ky.	111	22	.....	Britton Constr. Co., Ft. Worth. To start in Dec.
	Sect. 6-B-Elizabeth to Hebron, Ky.	111	22	.....	H. L. Gentry Constr. Co., Jackson, Miss. To start in December.
	Sect. 7-South-Hebron to Eaton, Ohio	60	20	140,000	Britton Constr. Co. To start in Oct.
	Sect. 7-North-Eaton to Lima, Ohio	60	20	.....	Mahoney Constr. Co., Mt. Pleasant, Mich. To start in October.
	Sect. 8-Magnolia, Ark. to Haynesville, La.	21	8	.....	Latex Constr. Co., To start in August.
	Sect. 9-Delhi, La. to Mayersville, Miss.	41	12	.....	Latex Constr. Co., To start in August.
	Mississippi River crossing at Mayersville	.....	20	.....	Latex Constr. Co.
Ohio Oil Company	Gurley fld., Neb. to Stanolind's Wyo.-Mo. line	20	.....	.....	Plans call for completion before Winter, 1949.
Pancoastal Oil Co., C. A. and Venezuela Atlantic Refining Co.	New oil fld. (Jose Ruiz-3 Concession) to Tucupido fld., Central Venezuela	24	.....	.....	Planned for early construction
Shell Pipe Line Corporation	Elk City fld., Beckham Co., to Basin-Ozark P. L. System, Cushing, Okla.	160	10	24,000	Announced plans set cost at $4 million. Pipe will be taken up from line that was replaced by Basin-Ozark System.
Southern Pipe Line Corporation	Plymouth to East Taft, San Patricio Co., S. W. Tex.	5	3	.....	Completed July 20 by Burley Stuart, Beeville, Tex.
The Texas Pipe Line Company	Chico fld. Wise Co. to Corsicana, Tex.	131	12	.....	Smith Contraction Corp., Ft. Worth, will work 2 spreads starting in August.
PRODUCT LINES					
Great Lakes Pipe Line Company	From Okla. & Kans. refineries along entire distribution system	1298 150	12 8	....	Project would almost double present capacity to 176,200 bbls. per day.
Salt Lake Pipe Line Company	Salt Lake City Refinery to Boise, Idaho	320	8	.....	Contracts awarded as follows:
	Salt Lake City to Burley, Idaho	175	8	.....	Smith Contracting Corp.
	Burley to Boise, Idaho	145	8	.....	Oklahoma Contracting Co., Dallas, and Grafe-Callahan Constr. Co., Los Angeles.
NATURAL GAS LINES					
Alabama-Tennessee Natural Gas Company	TGT line, Selmer, Tenn. to Tuscumbia, Ala.	82	10	.....	Lehman-Hoge & Scott, Harlingen, Tex., is to Complete Sept. 1.
The American Gas Transit Company	New Orleans, La., vicinity to Toronto, Canada	1500	30	500 mln.	Originally announced as extending only to Chicago. Would provide outlet for shut-in gas prod. on land and in Gulf. Line would have no offtakes before Canada and would cost $300 mln.
Arkansas-Louisiana Gas Company	Waskom fld, E. Tex. to Columbia Co., Ark.	72	20	200 mln.	Anderson Bros. Corp., Houston, will build this section.
	Columbia Co. to Perla, Cent. Ark.	81	20	140 mln.	This contract awarded to Latex Constr. Co.
Arkansas Western Gas Company	Madison-Washington Co. line to Fayetteville, Ark.	17½	8	.....	This loop was started by Worth James Constr. Co., Little Rock, Ark., Aug. 15.
Commonwealth Natural Gas Corp.	Va. Gas Transmission Corp's 20-in. line, Greene Co., to Norfolk, Va., vicinity	200	.....	.....	Amended application made to FPC. Original was for 537 mile 20-in. line from TGT in Kentucky.
El Paso Natural Gas Company	Present line to Alamogordo, White Sands Proving Ground, Holloman Air Base, New Mex. and Willcox, Ariz.	93	.....	.....	Project would also increase deliveries to Phoenix by 9 mln. Application made to FPC.

How 'safety-circle' driving cuts down accidents

"Know your safety-circle!" is an important lesson taught Standard of California drivers...and perhaps it can be helpful to you.

Your safety-circle is the distance you need to meet an emergency situation—a car stopping suddenly ahead, for example. Our drivers get a special test which tells them exactly how fast they react, but in general, it takes the average person a full second to see a hazard, think what to do and act. So, driving on a clear road, at 30 miles an hour, you should stay at least 7 car lengths behind the car ahead; when you drive 45 miles an hour, stay behind 13 car lengths.

More than 5,000 Standard drivers have studied this and many other safety principles in our Driver Training Program, besides passing thorough visual examinations. Last year, they drove 41 million miles with an accident rate 60% lower than the national trucking fleet average.

STANDARD OIL COMPANY
OF CALIFORNIA
plans ahead to serve you better

Pipe Line Construction (Continued)

Table includes projects planned, contracts awarded, and spreads or entire projects completed since the last issue of WORLD OIL

COMPANY	Origin and Terminus	Length (Miles)	Pipe Size (Inches)	Daily Capacity (Barrels Cu. Ft.)	REMARKS
Kansas-Nebraska Natural Gas Co. Inc.	Main, loop and laterals in Kansas & Nebraska	301	.....	.....	FPC also authorized 3600 additional hp. in present stations.
Lake Shore Pipe Line Comapny	TGT's proposed Kentucky-Buffalo line near Meadville, Pa., to Ashtabula, Ohio	45	.....	.....	Application to FPC. Erie Gas Service Co., Inc. has made similar application.
Michigan Consolidated Gas Co.	Austin fld., Mecosta Co. to Goodwell fld., Newaygo Co., Michigan	13 2	20 22	.....	Somerville Constr. Co., Ada, Mich. started in August.
Missouri Utilities Company	TETCO "Inch" line, Illmo, to Cape Girardeau, Mo	8½	6	.....	Will be completed in Sept. by Mid-States Constr. Co., Mt. Vernon, Ill.
Mountain Fuel Supply Company	Coalsville to Salt Lake City, Utah	32	20	23.6 mln.	Enoch Smith Sons, Salt Lake City, started work in Aug.
Northern Natural Gas Company	Garden City, Kansas, area	62	20 & 24	.....	To be started in Sept. by R. H. Fulton & Co., Lubbock, Texas.
Pacific Gas & Electric Company	El Paso's line, Needles to Milpitas, California	506	34	150 mln.	Bechtel-Price-Conyes, San Francisco, got this "Super Inch" underway in July.
Panhandle Eastern Pipe Line Co.	Loops in Kans. on Tex.-Mich. line	74½	24 & 26	.....	R. H. Fulton & Co. expects to complete in Sept.
Phillips Petroleum Company	Gathering system at Hansford Plant, Tex. Panhandle	30	24	.....	Completed in August by Vaughn & Taylor Constr. Co., Wichita Falls.
Stanolind Oil & Gas Company	Gathering system, Levelland fld., Hockley Co., W. Tex.	135	2 to 30	.....	Contract completed in Aug. by Deaton & Sons, Inc., Odessa, Tex. also included 15 miles of water line to Stanolind refinery.
	Gathering system, Fullerton fld., Andrews Co., W. Tex.	80	2 to 26	.....	Started Aug. 7 by Deaton & Sons, Inc.
Tennessee Gas Transmission Co.	Northeast Kentucky to Buffalo, N. Y. Main line loops Lateral lines	395 450 325	26 30	....	FPC has granted permission for this project which also includes additional 79,800 hp. Project will increase system capacity 1,060 mln. and will cost $90 mln.
	Buffalo, N. Y. to Worchester, Mass. Main line loops	383 543	26 24-26-30	200 mln.	Application for this plan has been made to FPC. Included are 4 new stations of 34,000 hp. and 51,200 hp. additional in existing stations. Would raise system capacity to 1,260 mln.
	Feeder lines near Agua Dulce, S. W. Texas	12	12	.....	Completed in July by Sheppard-Geiger Constr. Co., Corpus Christi.
United Gas Pipe Line Company	Four shut-in gas flds., S. La., to Beaumont-Port Arthur, Tex. area	26	.....	112 mln.	Application to FPC. United would purchase gas from Magnolia Petroleum.
United States Navy	New Gas fld. to Naval installations at Pt. Barrow, Alaska	6	.....	.....	Completed in July.
Virginia Natural Gas Company	Transcontinental's 30-in line at Buckingham to Norfolk, Va., vicinity	153	.....	.....	Application made to FPC. This line would serve almost same area as Commonwealth Nat. Gas' proposed line.

418 MILES
by one spread in one year

One pipeline spread of Latex Construction Company laid and took-up 418 miles of pipe during our fiscal year ending Nov. 30, 1948 . . . demonstrating the value of combining years of experience and specialization with a well integrated organization for more efficient pipeline construction.

The mileage of pipeline work done by this one spread was divided as follows:

Miles of Pipe laid, 16" and larger	306
Miles of Pipe laid, 8", 10" and 12"	62
Miles of Pipe taken-up and reconditioned	50

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General Contractors
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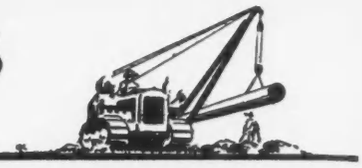
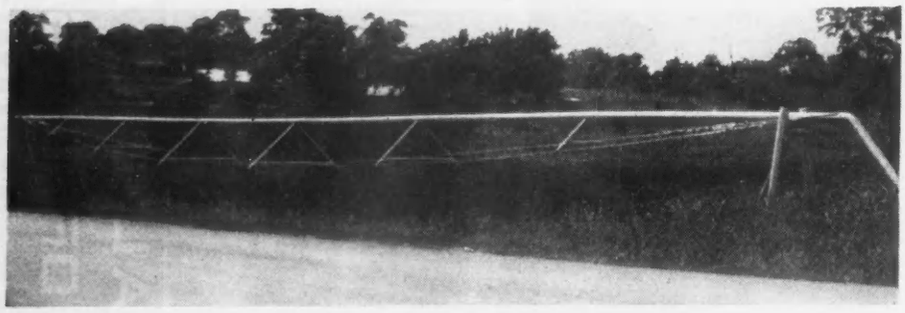
PIPE LINE HINTS



$10 is paid for each illustrated acceptable contribution. Mail to The Editor, WORLD OIL, P. O. Box 2608, Houston 1, Texas

HOW TO—Suspend Pipe Line Across Small Gulley



For suspending a pipe line across gullies or small streams with steep banks, one operating pipe line company uses a design of pipe line bridge that is the inverse of the conventional suspension type of bridge.

Supporting abutments, made from four-inch pipe or larger, are used only at the ends of the pipe line bridge. The pipe span between the abutments, is supported by an underslung truss, which is made from two one-inch flexible steel cables and a number of A-frames made of one-inch pipe. A saddle, in which the pipe line rests, is welded to the apex of each support. A-frames with the longest legs are used at the middle of the pipe line span, where the moment of turning due to gravity is greatest and where the lowest point of the cable would be, according to its natural catenary shape.

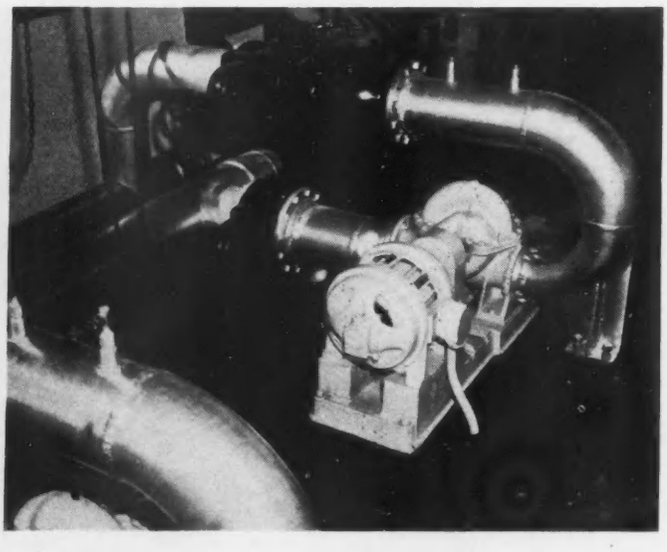
Progressively smaller A-frames are used between the middle of the span and the end abutments. A small saddle in which the cable can slide is welded to the legs of each A-frame just under the horizontal bar.

A long piece of round steel rod bent into a U-shape was securely welded to the upper side of the pipe line, just beyond the riser bend outside the supporting abutment at each end. Eye-loops were bent and welded at the ends of these U-shaped rods.

Heavy turnbuckles with hooks were fastened to the ends of the steel cables and were then hooked into the eye-loops of the U-shaped rods. By tightening the turnbuckles sufficiently, the necessary tension to hold the A-frames in place is applied, causing them to act as supporting compression struts.

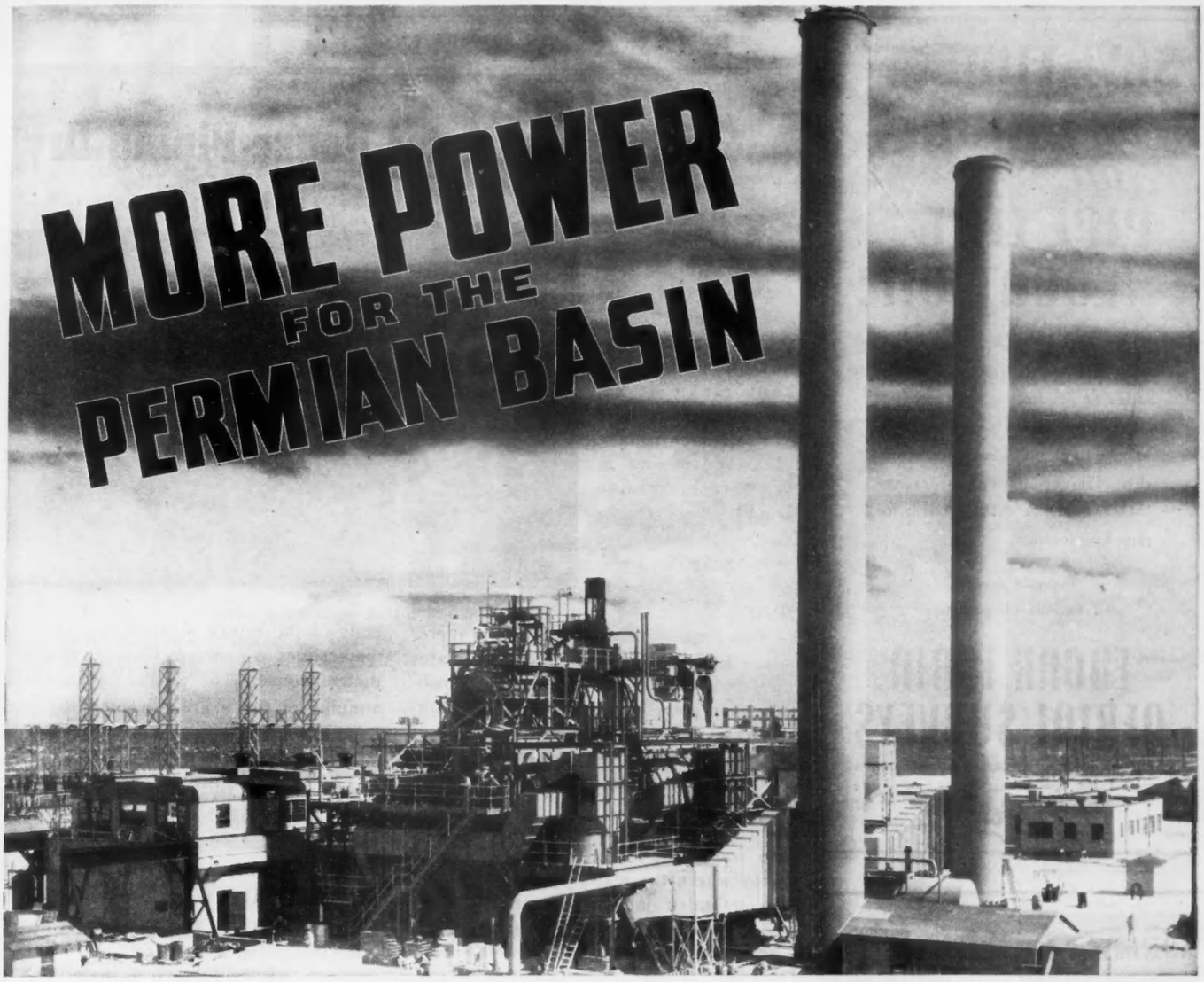
HOW TO—Save Space in Pump Room Arrangement

In the pump room where cooling water is circulated through the heat exchangers on interstage coolers, through cylinder jackets, etc., considerable space can be saved by a somewhat simple, yet convenient design in pump arrangement and connections. An example of this particular design, illustrated, shows a cold water centrifugal pump (one of a battery of four) connected to the suction line which parallels a discharge line.



Instead of supporting the discharge piping off the floor at the level of the suction line, and returning the discharge alongside the suction, this simple idea returns the discharge directly above the pump and suction. A 180-degree swedge bend connects to a swing check valve and a gate valve then to the discharge header. This line is elevated about four feet above the pump room floor, which places the line at a convenient height for repairs and maintenance.

Another advantage of such a design is that of insuring a prime on the pump. When this pump is taken out of operation, the suction and discharge valves are closed, thereby trapping a supply of water in the 180-degree pipe bend on the discharge line. When the pump is started again, this head of water insures a prime.



• In the heart of the Permian Basin, on a section of land which up to a couple of years ago, had been inhabited mainly by jackrabbits, coyotes and road-runners, there are big things going on.

Right where you would least expect it, Texas Electric Service Company has built the new, stream-lined Permian Basin steam power plant of 50,000 kilowatts capacity, half of which — 25,000 kilowatts — has been on the line since last June, serving the many and varied industrial, residential and commercial enterprises of this great and growing area. The other half — the second two generating units of 12,500 kilowatts each — has just been completed.

In addition to this ultra-modern power plant, other expansion developments of Texas Electric Service Company have included new transmission and distribution lines — new and enlarged substations — and other new and improved electric power service facilities to make this additional power available whenever and wherever in the Permian Basin area it is needed.

The power system of Texas Electric Service Company has for many years supplied electric power for well pumping, pipe line pumping, refining and well drilling in many Permian Basin oil fields. Electric power, through these many years, has been one of the greatest single aids in the development of the Permian Basin's oil potentials.

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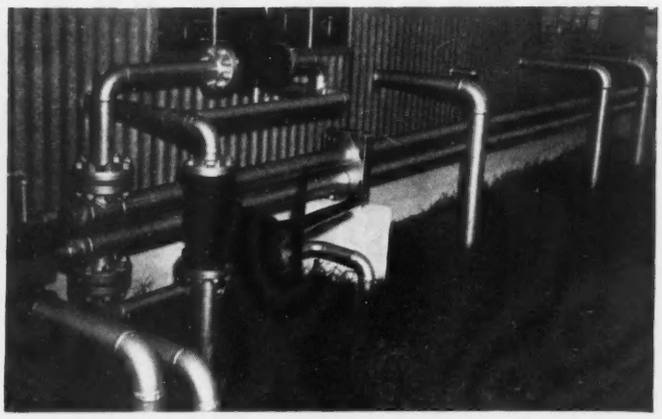
PIPE LINE HINTS

HOW TO—Keep Meter House Piping Dry



A rather large meter house at one gas booster station was constructed of metal and mounted on a solid concrete foundation which was kept clean at all times. During the summer months, the elevated piping in the meter house would sweat excessively, thereby creating puddles of water on the concrete floor.

This continual sweating of the meter runs downstream of the orifice plates cause unwanted cleanup jobs. This problem was solved by employing one single return section of a heat exchanger unit shown supported on concrete foundations at the rear of the meter house.

The heat exchanger element contained a concentric pipe which carried hot water from the booster pump engines where the water was used to cool the cylinder jackets. Temperature of the heating water was about 150° F.

Reducers were welded to the open ends of the return element and the hot water lines connected. Gas entering the meter house was piped through the annulus of the heating element by two flanges which were welded to the top and bottom respectively of two tees welded to the ends of the heating element. Gas in the annulus surrounding the hot water pipe travelled the complete length of the heater element, and sufficient heat was transmitted to prevent condensation in the elevated meter lines inside the meter house.

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Made in 1½, 2, 3, 5, 10, 15 and 20 gallon sizes. (Push-Button Faucet at slight additional cost.)

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WATER CANS
& COOLERS

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GOTKOOL WATER COOLER
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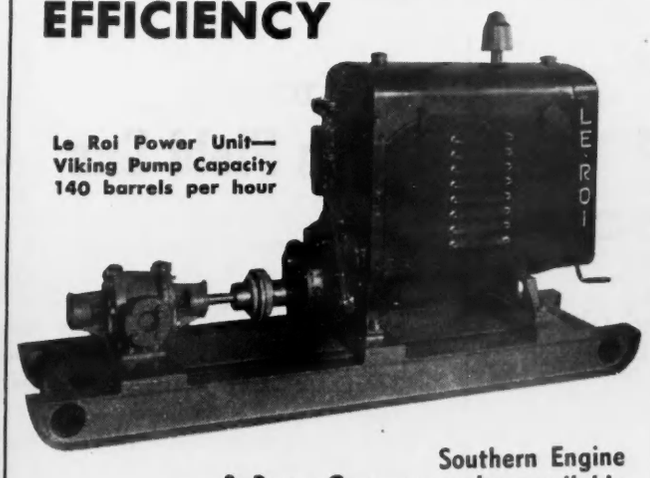

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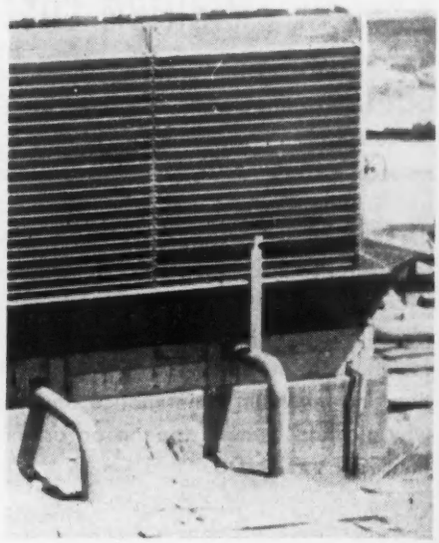
HOW TO—Fabricate Splash Board for Cooling Tower Base

Considerable amounts of water in the pond at the base of the cooling towers at compressor stations are usually blown out of the pond during windy seasons, particularly if the wind rushes through the towers in swirling gusts. In instances where the spray water must be purchased from city or village water systems, it was deemed advisable as well as economical by one operating company to build slanting splash boards around the base of the cooling towers at the compressor stations which did not have the protection of a wind break.

Such splash boards prevent an appreciable loss of water due to gusts of wind blowing through the cooling towers, thereby effecting a saving in the current water bills. These splash boards are made from 2 x 12-inch cypress or redwood. Lower edge of the splashboard rests on the vertical walls of the ponds. The top edge is supported by galvanized brackets which are attached to the wood framework of the cooling tower.



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Gives the owner the pipe line he deserves —gives the contractor better production methods and economy.

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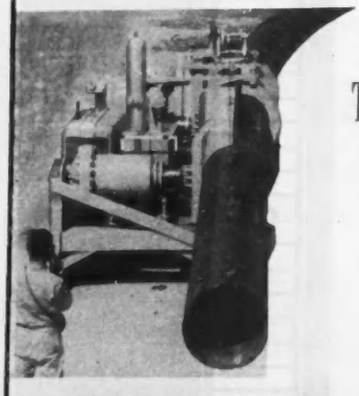
✔ CINCH ELIMINATES RISK IN BENDING
✔ CINCH AFFORDS A CONTINUOUS OPERATION



THE COODY BENDER COMPANY
HOUSTON, TEXAS

PHONE YUKON 5441-2-3
5709 HOLMES ROAD
P. O. BOX 9271, CENTRAL PARK STATION

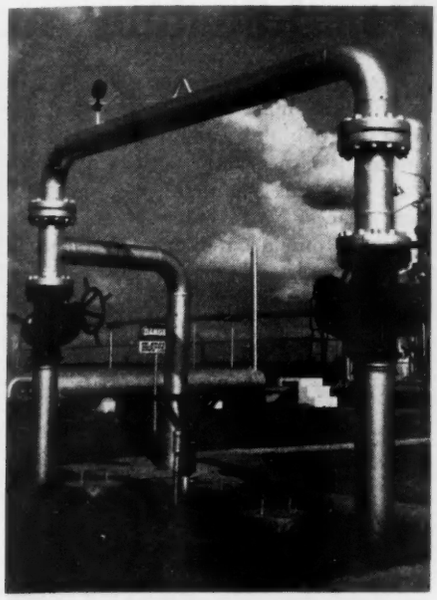
HOW TO— Tie In Field Gas

At one booster station along a large gas transmission line, additional gas was added to the flow stream. This gas was supplied by a gas-distillate field, and the pressure in the feeder line varied. There were occasions when the feeder line pressure was below normal main line operating pressure. At other times, the feeder line pressure was above operating pressure.

Gas supplied by the near-by gas-distillate field was first run through a dehydrator to drop the moisture content to mainline requirements. Since this feeder line pressure varied above and below main line operating pressures, connections had to be made to place the gas directly into the transmission line when the pressure was high, or connect it to the booster station pump suctions when the feeder line pressure was low.

Illustrated is the arrangement made for this dual connection. The booster station discharge line, operating on

about 740 pounds pressure, is connected to the vertical valve setting shown at far left. Immediately to the right of this vertical line, and welded directly to it, is the feeder line from the gas dehydration unit taking gas from the field. The discharge line is connected by a horizontal run to the suction line at far right. If the field gas pressure was

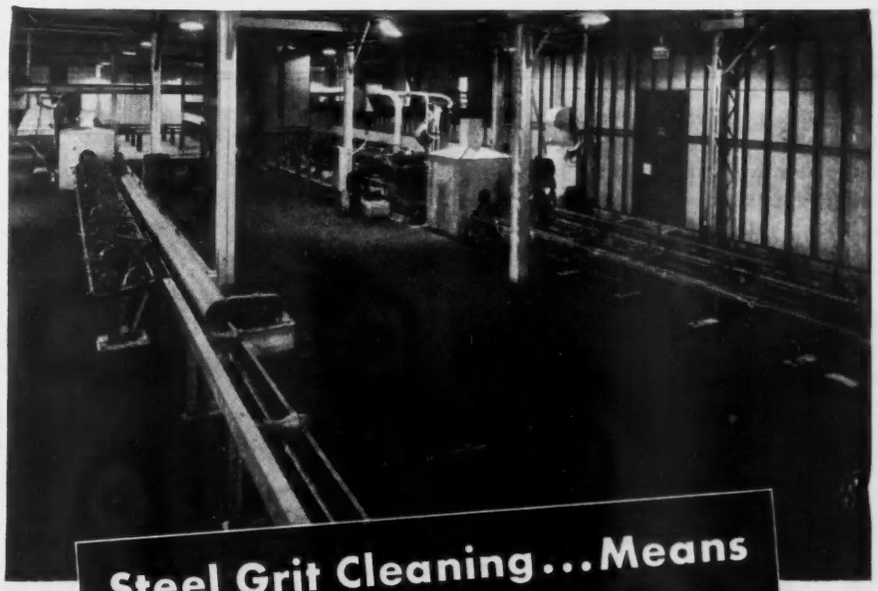


below main line pressure, the feeder line was connected to the booster station suction so the pumps could build up the pressure to line values. In the event the field gas was at a higher pressure than line pressure, the former line would be diverted directly into the booster station discharge line. The valves are mounted at a convenient height to facilitate their operation since they are used frequently.

HOW TO—
Light Sight Feed

Most gas compressors are painted a solid color, frequently a dark green or other shades which do not reflect light. Force feed lubricators mounted above the horizontal compressor cylinders have sight feed windows so the operators can visually check the delivery frequency of lubricant to the various bearings. At night, and on dull days a portable lamp is sometimes used behind the units to see if the oil is being delivered.

The job of inspection can be cut short and made easy and accurate, by installing a reflector behind the battery of sight feeds so the operator, when standing in front of the compressor cylinders,



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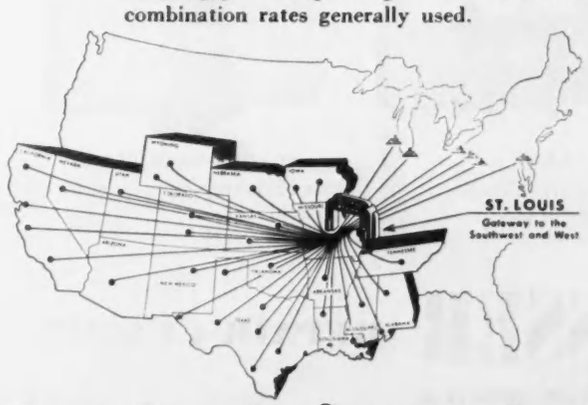

standard pipeprotection inc.

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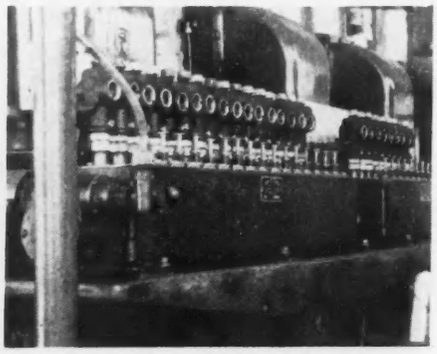
can check positively the delivery of oil drops. The reflector can be made of a long narrow strip of sheet aluminum having brackets to attach to the engine at the point where the most effective reflection will be obtained.

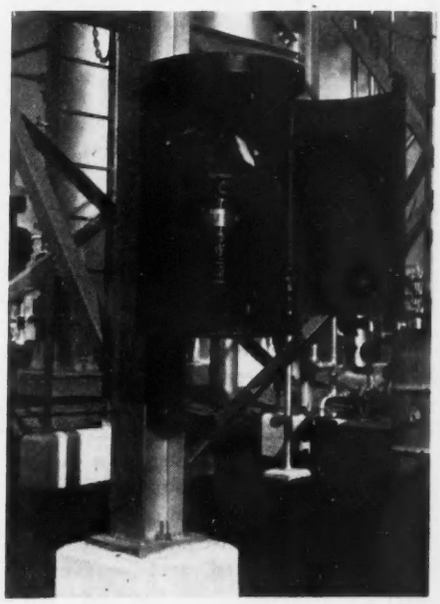
The strip of metal is painted with glossy white enamel which hardens quickly and dries with a hard surface so wiping occasionally with a clean cloth will maintain the desired degree of reflection of light through the lubricator



sight feed units. As the reflection is uniform over the full length of the strip of metal, it provides better illumination than one or more electric lamps, and does not require wiring.

HOW TO—
Mount Container

For adequate protection against spot fires which may break out at various points throughout a pumping or booster station, it is necessary to locate CO_2 or foam-type fire extinguishers at strategic places. Since many of such locations are outside and near scrubber oil



tanks, dehydrators, etc., these extinguishers had to be protected if they were expected to function properly in an emergency. Such protection also lengthened their usable life.

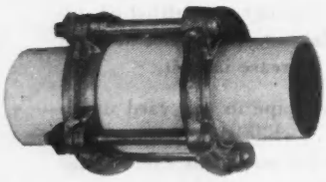
Illustrated is a very practical and economical method of providing protection for these outdoor extinguishers. A 30-inch section of 24-inch pipe was sealed at both ends and bolted to a vertical I-beam. A relatively large door was cut into the 24-inch pipe to include an arc of about 150 degrees to provide an opening large enough to remove the extinguisher easily. It was hinged on one side and equipped with a hasp which was held closed with a steel peg. The extinguisher rests freely inside this cylindrical housing protected from both sun and rain. It was mounted about four feet off ground so that the extinguisher could be removed rapidly by any employe.

CLAMP DOWN ON LEAKS
...day or night, in a matter of minutes

All you do with a Dresser Clamp is put it around the leaking pipe and tighten a few bolts. It's the quick, simple way to stop leaks in any weather, on any pipe—without shutting down. They're favored by maintenance men everywhere.

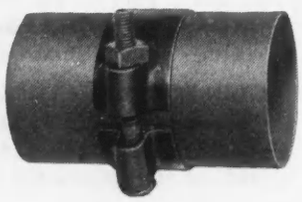
68 years of piping experience stand behind these modern clamps. Specify Dresser Grade 29 Gaskets for greater protection.

The four styles shown here are just part of Dresser's complete line of repair products. Your nearest oilfield supply store carries them... and you can get overnight delivery from our Houston warehouse. For complete specifications, write for our Oilfield Catalog. Be ready for fast repairs by keeping Dressers in stock.



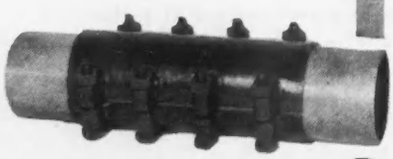
COLLAR CLAMP

Styles 4 and 41, for repairing and preventing leaks through threads of screw collars.



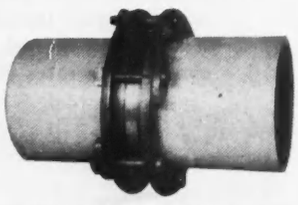
BAND CLAMP

Style 77B, for repairing small leaks and holes in the run of pipe.



SPLIT REPAIR CLAMP

Style 79B, for repairing pitholes and longitudinal splits in pipe.



POROUS-WELD CLAMP

Style 55, for repairing circumferential weld leaks.

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SWEDEN'S Shale Oil INDUSTRY

By H. E. LINDEN

President, Linden and Company, Los Angeles

FIRST REFINED in Sweden in 1942, shale oil has become a commercially successful Swedish industry as a result of improved methods of production. The author relates the history of the development, and describes the various methods employed to produce shale oil and its by-products. Cost data and a listing of the required plant equipment are presented.

THE shale oil industry in Sweden is well established by commercially proven continuous methods which have been in operation for a number of years.

The activities of the Swedish Shale Oil Company, a wholly owned government corporation, were initiated shortly after the outbreak of World War II. Since little knowledge and experience were available at that time regarding shale oil products, shale oil refining, and the manufacture of by-products, the company based its production program on four different methods. Selection of four methods has enabled the company to determine the most efficient features of each method, which subsequently enabled the company to apply or combine the results and make future extensions of the plant. A development program of this type naturally involved rather heavy capital expenditures, but on the other hand it was designed to accelerate the establishment within a short time of a shale oil industry which could survive in the competitive market.

The production of oil commenced in January, 1942, or about one year after the forming of the company. The production capacity of the combined methods was subsequently developed to the point of a total oil production in the fiscal year of 1944-45 of 515,000 barrels.

The total initial capital development between January, 1941, and January, 1946, aggregated approximately $22½ million. A very large portion of this amount was invested in commercial size experimental plants and research work. Upon the conclusion of the war the Swedish government decided to continue the operations of the Swedish Shale Oil Company's activities, working in a free and competitive market without subsidies of any type or kind whatever.

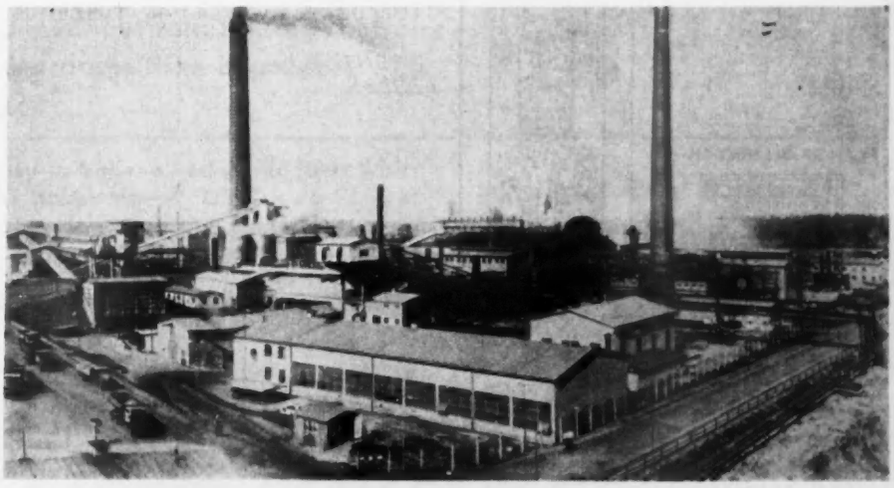
The peacetime program includes large capital expenditures for the purpose of increasing the productivity. This program will be completed in the year 1953, and will require an additional total capital expenditure of $10,550,000. At that time the production will be as follows:

Gasoline	138,000 barrels
Kerosine and Fuel Oils	427,000 barrels
LPG Products	5,750,000 gallons
Sulphur	25,600 tons
Quicklime	45,000 tons

In addition the company will produce oils for impregnation of wood, ammonium sulfate, building materials, detergents, etc. Regardless of the fact that the Swedish shale is very poor and will only yield approximately 5 percent oil, it is estimated that net earnings upon completion of the program will be most satisfactory.

The following is a brief description of the different methods employed by the Swedish Shale Oil Company in the production of shale oil and by-products:

1. THE KVARNTORP METHOD. This method has been developed from an older process called "Bergh-system" invented by a mining engineer, S. V.



Plant of the Swedish Shale Oil Company at Kvarntorp, Sweden.

Bergh, in 1920. The Kvarntorp Method utilizes the heat value of the oil shale to obtain necessary pyrolysis temperatures to accomplish the distillation process. The method is simple and effective using the force of gravity principle during the distillation process. The retorts consist of vertical cast iron pipes eight inches in diameter and nine feet high. A series of five retorts is embedded in a walled combustion chamber, each series of five retorts with combustion chamber constitutes one box, 14 boxes making one block. The oil shale is charged mechanically at the top of the retorts and passes three retort zones, the preheating zone, the distillation zone and the burning zone. The burning zone is located in the combustion chamber immediately below the retorts. The distillation heat is evolved at this zone by burning the distilled shale coke. The combustion gas passes outside of each retort delivering heat to the distillation and preheating zones. A pressure equilibrium is maintained in order to prevent the combustion gases from being mixed with the oil gases. The burnt coke, the ash, is discharged automatically at the bottom of the combustion chamber, the whole process thus being continuous. The ash is transported to dumps.

Boiler Surfaces

Although the old Bergh Method worked satisfactorily with little manual attendance, the throughput of oil shale per unit furnace area was comparatively low. By introducing boiler surfaces in the combustion chambers the intensity of the coke is greatly increased, which results in a proportional increase in throughput, the actual results hitherto accomplished in commercial size test runs being an increase in oil shale throughput of 2½ to 3 times per unit furnace area and time.

The company has three furnace units, all of which now are being successively rebuilt and reconstructed in accordance with the Kvarntorp Method. Two units each hold 16 blocks of 70 retorts; one unit holds 24 blocks of 70 retorts. This larger unit is approximately 200 x 83 feet. By rebuilding the units, the throughput of the smaller furnace will be increased from 400 tons of oil shale to a minimum of 1000 tons of oil shale per day and unit, the larger unit from 600 tons of oil shale to a minimum of 1500 tons of oil shale per day. The oil shale charged to the Kvarntorp furnaces is crushed to approximately 3-27 millimeter particles.

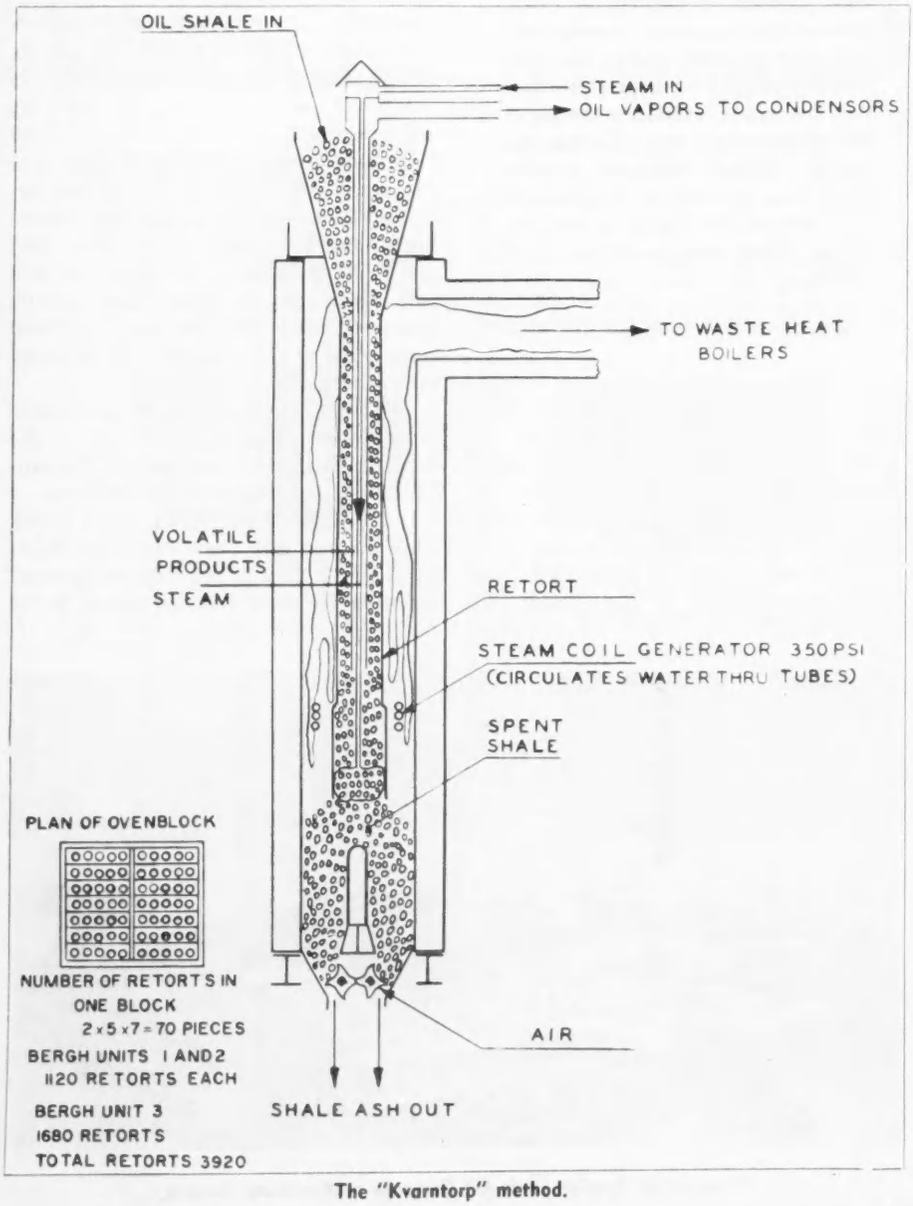
2. THE INDUSTRIAL METHOD. This method comprises a horizontal channel type retort, invented in Sweden by the civil engineer, Fr. Carlsson, and further developed at Kvarntorp, The principle of this unit is basically different from the Kvarntorp Method where the distilled shale, coke, is burned in a continuous operation in one furnace. In the Industrial Method process the distillation heat required is obtained from separate furnaces burning gas or oil, the combustion gases being blown through the retort in heating tubes. The distilled shale, coke, containing approximately 1000 kilo calories per kilogram, is discharged from the retort and transported to a separate coke burning furnace for complete combustion.

Construction of Retort

The retort consists of one approximately 200-foot long horizontal, circular tunnel with a diameter of 12 feet. Each end of the retort is equipped with steam locks to provide for a gas-free entrance and exit of the shale. The shale is conveyed through the retort in perforated cast iron trucks 8 x 8 x 1½ feet in size, each with a capacity of approximately 2-4/5 tons. The retort holds 24 trucks at a time. The aforementioned distillation heat is generated in three furnaces alongside the retort supplying three terminal sections of the retort with terminal temperatures of approximately 480°, 400°, and 320° C. In order to increase the heat transfer from the heating tubes to the shale, the oil gases inside the still are blown in spiral action through the perforated trucks loaded with shale. The Industrial Method process is continuous.

The company has erected two industrial method units of similar size, each with a capacity of 650 tons of oil shale per day. The oil shale charged to the IM retorts is crushed to 27 millimeters plus particles.

The discharged shale coke was earlier transported to waste dumps, the remaining calories in the coke not being utilized. Since the coke has a low melting point complicated problems were encountered to render an effective method for burning it. Due to the low



The "Kvarntorp" method.

This CHECK CHART will TELL THE STORY

Answer each question by writing "Yes" or "No" in the blank spaces in the column at right

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6	Can the springs be completely flattened several times as they pass tight spots or "dog legs," without losing a large percentage of their centering efficiency?	YES	
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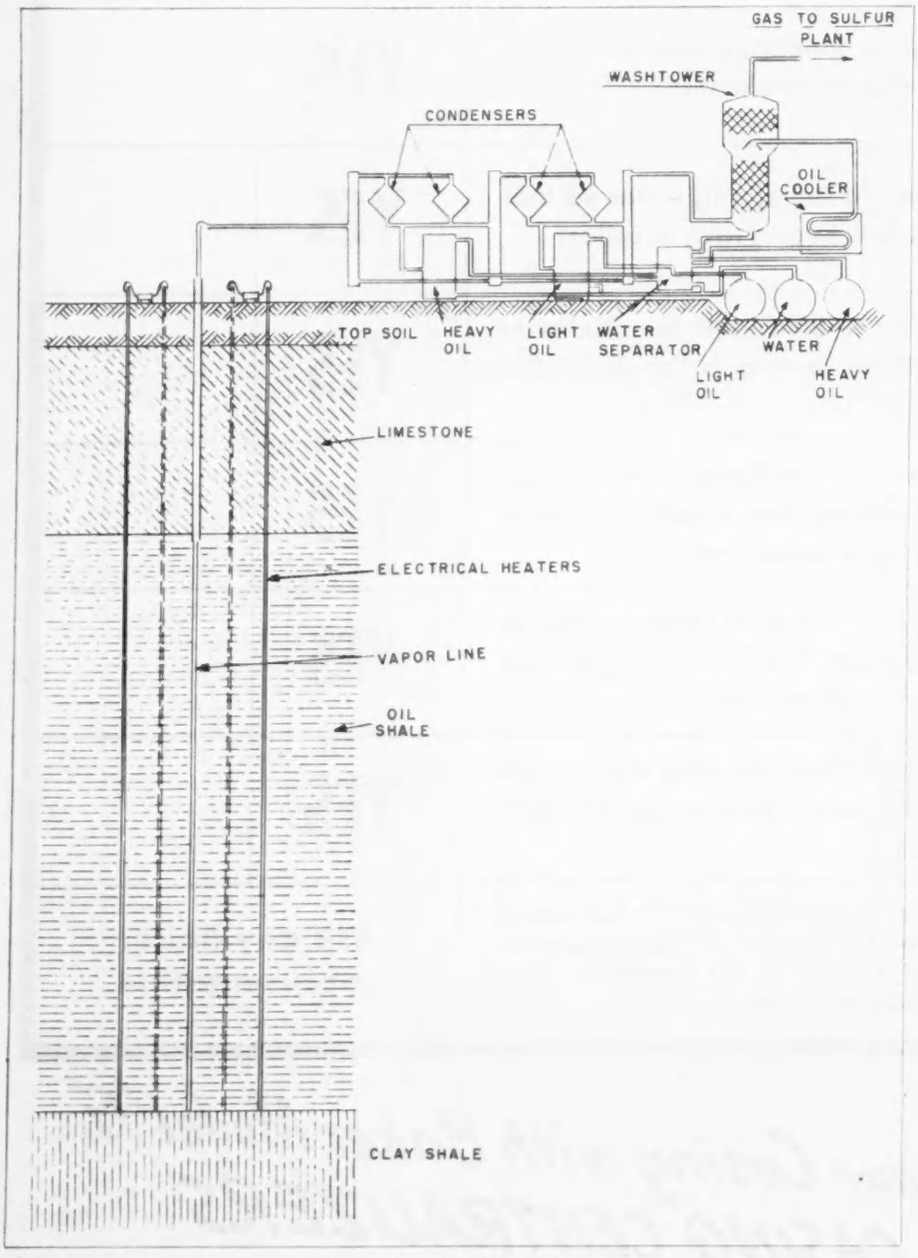
melting or sintering point, together with the large amount of ash in the coke, no known type of furnace would accomplish the burning process satisfactorily. The company solved the problem by constructing a separate furnace where boiler surfaces (tubes) were introduced in the combustion zones for controlling the combustion temperatures. This method was actually the initial step in the evolving of the Kvarntorp Method. The shale coke discharged from the IM process is now burned for the generation of steam in a coke burning furnace.

3. THE ROCKESHOLM METHOD. The Rockesholm Method was developed by Engineer S. Hultman and Mining Engineer N. Gustafson from the Scotch method. The Rockesholm process comprises 72 vertical retorts approximately two feet in diameter and 26 feet high. The upper part of the retort is made of cast iron, the lower, somewhat wider part, of schamotte brick, four retorts constituting one block. The upper and lower part of each retort is equipped with gas locks. The oil shale is charged at the retort top and the coke discharged in chutes at the bottom of the furnaces. As is the case in the IM process the distillation heat required in the Rockesholm Method is attained externally by means of gas burners placed in a crown at the bottom of each retort, the combustion gases passing along the outside of the retort pipes in walled combustion chambers. The coke discharged contains some 1100 kilo calories heat value.

To alleviate the distillation process, steam is injected at the retort bottom which increases the gas yield and also results in the formation of caustic ammonia. This ammonia is soluble in the condensation water and is subsequently transformed to ammonium sulfate. The oil gases are drawn off at the upper part of the retort and the distilled shale, the coke, is transported to the coke combustion furnace for the generation of steam in the same manner as in the IM process. The size of the Rockesholfm furnace is approximately 180 x 20 feet with a capacity of 600 tons of oil shale per day. The company has erected one Rockesholm unit.

The oil gases derived from the Kvarntorp, IM and Rockesholm processes are condensed in a conventional way at the condensation plants connected to the different units. The crude shale oil is piped to the storage and refining site. The permanent gases are piped to a central gas holder for subsequent treatment at the sulfur plants and at the absorption plant for the absorption of light gasoline fractions remaining in the gas.



The "Ljungstrom" method.

Electro-Thermal Process

4. THE LJUNGSTROM METHOD. The electro-thermal production method developed at Kvarntorp differs entirely from the three other processes in that it produces the oil direct from the oil shale in place. The method was invented by Dr. Fredr. Ljungstrom. The process is based on the principle of electrically heating the oil shale in place to a satisfactory pyrolysis temperature causing distillation. The oil vapors are drawn off in open holes in the center of the pattern. The functioning of this method is dependent upon a suitable cap rock covering the shale strata and supplying an insulated layer for the purpose of eliminating heat and gas losses. The cap rock at Kvarntorp is of limestone with a thickness of 16 to 28 feet. The underlying oil shale has a thickness of approximately 53 feet.

The heating of the oil shale is effected by putting down heating elements in holes in a hexagonal pattern to the bottom of the shale strata. Each hexagon has a radius of nine feet, the elements put down in each corner having a diameter of two inches. The open hole is drilled in the center of the hexagon down to the bottom of the shale strata. The casing, which has a diameter of two inches is driven only down to the bottom of the cap rock. When applying electrical energy to the heating elements the oil strata is successively heated to the distillation temperature and the oil gases evolved travel towards the free hole by means of a slight pressure in the strata. The oil vapors derived from the open hole are conducted to a condensation plant having air cooled condensers from which crude oil and the permanent gases are piped to the storage

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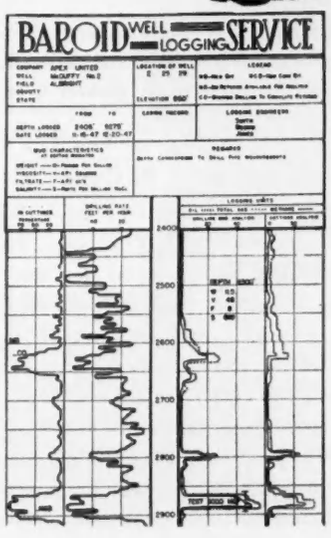

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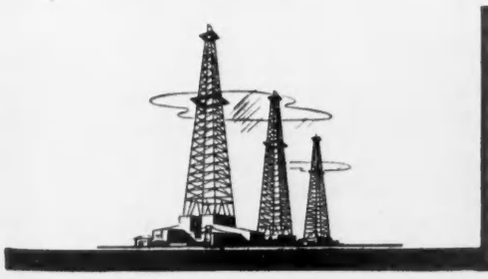

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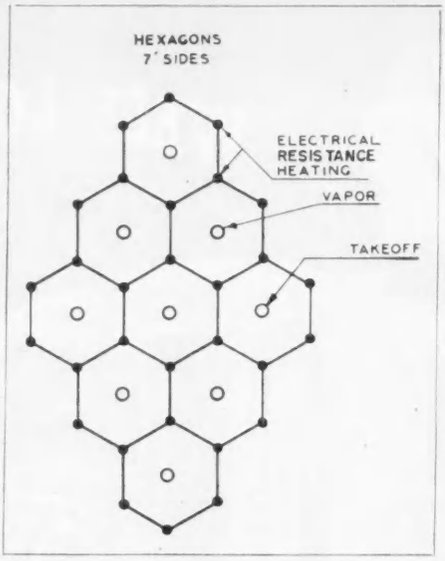
site and central gas holder respectively.

The Ljungstrom field has a width of 600 feet with 80 elements in one row. Two-thirds of the field at a time is subject to heating and one-third subject to distillation. The heating period covers about 120 days. The delivery of electrical power is accomplished by means of eight transformer banks and the electrical energy fed has varied from 14,000 to 20,000 kilowatts. Feeding 14,000 kilowatts, the production approximates 20,000 cubic meters (126,000 barrels) of oil and about 20 million cubic meters of gas per year.

When processing the rather poor Swedish oil shale six kilowatt hours are required per one cubic decimeter of oil and one cubic meter of gas, the latter with a heat value of 9500 kilo calories. The gas contains sulfur and other valuable components.



Hexagonal pattern for placement of electrical heating units for Ljungstrom method.

Auxiliary Plants

THE COKE BURNING FURNACE. The utilization of the remaining calorific value left in distilled shale, the coke, discharged from the retorts is of imperative importance within the shale oil industry. Commencing the activities at Kvarntorp, this fact was readily understood and a solution of the problem had to be rendered. Burning shale coke conventionally the charging capacity is limited to approximately 100-kilograms per square meter grid area an hour. By introducing steam generating surfaces in the furnaces the throughput capacity is increased multifold. The coke burning furnace is built on this principle. The coke from IM and Rockesholm is burned in the coke burning furnace for the generation of steam at a rate of 35 to 40 tons of superheated steam (450° C.) per hour. Nine tons of steam generated from each ton of shale coke charged to the furnace.

The unit consists of 40 furnace shafts together with five boilers for the utilization of flue gas heat. Thirty-two of the shafts are maintained for the generation of steam and eight for superheating. The coke burning furnace dimensions are 150 x 100 feet.

SULFUR PLANTS. The hydrogen sulfide averaging about 20 percent in the shale gas is converted to sulfur in three sulfur units. These have each a capacity of about 7000 tons of sulfur per year.

GAS ABSORPTION PLANTS. In order to increase the inherent value of the shale gases a plant is under erection for absorption of hydrocarbons with three and four carbon atoms—liquefied petroleum gas. This plant is being delivered by an American manufacturer and will go on stream in June, 1950. The unit has an hourly capacity of 275,000 cubic feet.

REFINERY. The composition of shale oil, and especially the shale oil processed at Kvarntorp, is complex, causing several intricate refining problems, problems which have for many years been studied at the Royal Swedish University of Technology. Based on the results attained, the Research department of the company has developed processes that refine satisfactorily all derivatives obtained from crude shale oil. The refinery comprises atmospheric topping, distillation and fractionation units together with a plant for chemical treatment of gasoline, and if necessary kerosine. The refinery has a capacity of 925 barrels per day of crude gasoline.

LIME KILNS. Quicklime is manufactured in three vertical shaft kilns of special construction. Each kiln has a capacity of 80 tons of slaked lime per day.

Quality of Products

The various products produced by the Swedish Shale Oil Company are of high quality with a good demand both in the domestic and foreign markets. The gasoline compares favorably with imported brands; fuel oils are distinguished by their relatively low pour points. Approximately 50 percent of the fuel oil produced is a light domestic heating oil and the rest is a medium heavy industrial oil. The whole quantity of fuel oil derived from the Ljungstrom field is of distillate type comparable to domestic heating oils. All oil products comply with official specifications and are in some instances of premium grade.

The cost of mining the shale is approximately 66 cents per metric ton delivered at the retorts. Based upon a shale yielding 10 percent in oil the Swedish methods could produce crude shale oil for $2.17 per barrel exclusive of the returns from the sale of by-products. In Sweden the sale of by-products cut this cost approximately in half.

About the Author

H. E. LINDEN, president of Linden and Company, Los Angeles, is a native of Stockholm, Sweden, and takes a keen interest in that country although he has lived in the U. S. 45 years. Prior to going into business for himself he was executive vice president of the Southwestern Engineering Company, Los Angeles, and general manager of the Technicraft Engineering Company, a division of Lane-Wells Company. In 1946 he was engaged by the city of Gothenburg, Sweden, to make a report on the feasibility of building a pipe line for petroleum products from Gothenburg to Stockholm and at the same time he arranged for the purchase of a 15,000-barrel per day oil refinery from U. S. war surplus which was shipped to Gothenburg and has just gone into operation. Information contained in this article on the oil shale industry in Sweden was obtained during a recent visit to the plant of the Swedish Shale Oil Company.

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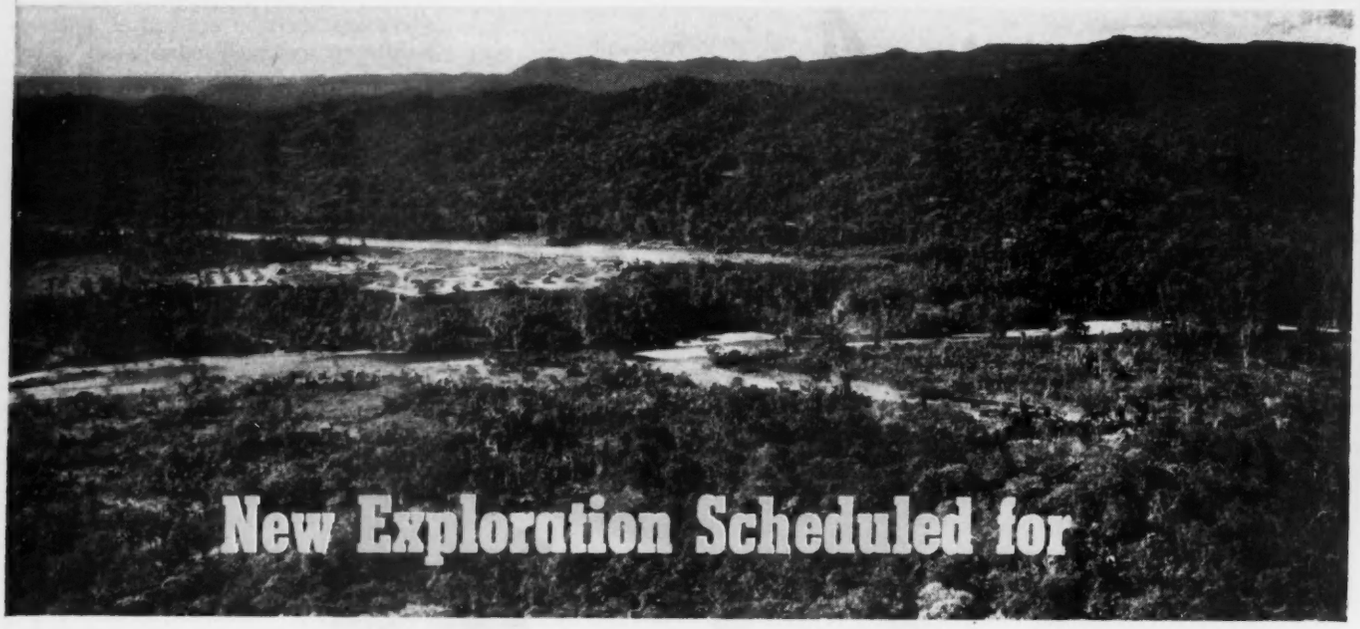

New Exploration Scheduled for Ecuador

A NEW wildcat is scheduled for immediate drilling in the Ecuadorian "Oriente," the vast area of Ecuador lying east of the Andes in the upper drainage area of the Amazon system. The latest wildcat is the Villano 1, to be drilled in the west central portion of the Oriente, and another in the series of exploratory tests drilled during the past four or five years by Shell Group. This, and subsequent operations will be carried on by a joint enterprise composed of the Shell Group and Esso Standard Oil Company (Ecuador) S. A. The former had been the sole owner of the concession of 8 million hectares (19,768,000 acres) prior to the latter part of 1948 when the joint operating arrangement was reached with Esso Standard. Meanwhile 50 percent of the original concession area has been relinquished, to go back into the national reserve, and the search is to be continued on the remainder. Seismic work, which had been discontinued for a while during the past year, will now be renewed.

The exploration of such an area is an extremely expensive project. The operations are carried on in the remote hills and jungles of the Amazon basin while the sources of supply and base of operation are on the western side of the Andes with no communication between the two regions except by air transport. Every piece of equipment used is carried by air from the supply bases on the western side to be landed on strips carved from the jungle in the Oriente. Geological and seismograph crews are landed as near to the scene of their operations as possible by amphibious aircraft wherever streams are suitable. Once in the jungle they are supplied by air, with all medical supplies, foodstuffs and much replacement equipment dropped by parachute.

For drilling operations the problems are much more complex. There are three heavy drilling rigs in the area, all of which were carried by air. For landing the heavier aircraft it was necessary to construct airfields at each location or near enough to the actual location that roads could be built. Equipment for construction of runways had first to be taken apart and carried in by amphibious planes, then assembled on the ground before work could be started clearing and preparing landing strips. The heavy drilling equipment could then be flown in knockdown form and assembled on the actual drilling location. This is an extremely costly operation, and maintenance of drilling and exploration operations is done only through expenditure of several million dollars yearly.

During 1948 three wildcats were completed in widely separated areas of the Oriente. The Cangaime 1 was abandoned in the southwestern part of the concession at a depth of 3450 feet. Oglan 1 in the central part of the area was dry after drilling to 9438 feet, and Tiputini 1 was abandoned at 5515 feet. The last named test is in the extreme eastern corner of Ecuador, near the Brazilian border. For each of these tests complete landing and maintenance facilities had to be constructed, since there is no means of surface transportation between the various locations even after crossing the mountains. The necessity of flying in equipment was further complicated by the altitudes at which planes had to fly. The completion of the three tests last year brought to five the total number of wildcat drilling operations finished since operations started in the region. The subsurface formations found in these wells are favorable for possible oil accumulation, being largely of Tertiary and Cretaceous age, and showings have been found in some of the wells, although none have been commercial possibility.

Elsewhere in Ecuador, the petroleum activity is concentrated in the development and extension of the older fields on the Ancon Peninsula of extreme southwestern Ecuador. Largely through the development of new shallow sand areas within the limits of the older production, the operators have been able during the past two years to show increases in the output. During 1948 the fields of Ancon Peninsula produced a total of 2,610,719 barrels of oil, or a daily average of 7133 barrels throughout the year. This compares with 2,426,450 barrels produced in 1947. The greater part of this output is produced by Anglo-Ecuadorian Oilfields, Ltd., and Ecuador Oilfields Limited, both of

Above is a view of completed camp site and airstrip for an exploratory well in the Eastern Ecuador jungle.

LEFT: Bulldozer, immediately after having been landed in parts by an amphibian. It was assembled at this site and began work on the site for the airstrip at Tiputini, most remote of all operations in the Oriente of Ecuador.

RIGHT: Aerial view taken while site was being cleared for a new jungle wildcat.

which are British firms. During the year the former drilled 15 wells in a new shallow area known as Santo Tomás which is part of the Ancon field. These wells were encouraging since they are shallow enough to reach with portable power drilling equipment, capable of being completed at depths from 960 to 1860 feet, and yield producers which average around 90 barrels daily on initial tests. Other shallow drilling in the field yields wells which average about 30 barrels daily. Some exploratory work has been done through deep drilling for possible lower formations, but this has failed to yield any great measure of success.

One of the problems of Ecuador operators is shortage of equipment. This is shared by all British firms operating in territory of comparatively low-yield wells, where expenditure of dollars for much equipment available from American sources is closely scrutinized for obtaining the best return in oil for the dollar cost. In the case of Ecuador, the total production remains below the potential since it has become necessary to shut in producing wells of relatively low yield in order to use production equipment such as tubing in new wells capable of higher production. Early in 1949 one company alone had 56 producible wells closed in, mostly because the producing material was used to equip more prolific wells.

During the past wear a total of 60 wells were drilled in the Ancon Peninsula fields, of which 53 were oil producers and 7 were dry holes. This represents a substantial increase over operations during the preceding year, both in the number of wells drilled and in the footage represented. However, both drilling and production were below the point which might have been reached during the year but for delays caused by strikes. The actual strike took place during the last half of June and the first half of July, following a period of labor unrest, and much efficiency was lost outside of the time lost through the strike itself. During the strike workmen denied access of the foreign staff to fields or offices, although relations have been quite satisfactory since settlement of the strike which was called in an effort to strengthen demands for a substantial increase in wage scales.

Significant changes in labor's attitude took place early in 1948 following a change in the directorate of the labor syndicate. There was the usual buildup of inflammatory speeches and bulletins followed by demands for an all-around increase of 15 sucres per day in basic wages (13.5 sucres equals $1 U. S.). The affected companies have indicated the entire campaign, including the strike and the press campaign, were organized by radical elements not working in the industry, and was timed for the period when the provisional government was nearing the end of its term of office, and results of the presidential election were still pending.

Settlement Reached

Actually, an arbitration board awarded an increase of 10 sucres per day, but upon appeal this was reduced to an all around increase of 4½ sucres a day. Apparently the settlement was entirely satisfactory.

Refining capacity of Ecuador was boosted early in 1949 when new units of the Anglo-Ecuadorian refinery at La Libertad was placed on stream to bring throughput capacity up from 2700 barrels daily to 5200 barrels a day. Construction of the new facilities started late in 1947 and was actually completed during 1948, but the tie-in to place it on stream was delayed for several months by the shutdown during the strike. Gasoline and other refined product stocks had been built up to take care of the three-week period during which the plant would have to be shut down to tie in the new units, but the stocks were used up during the strike and the plant has had to remain on stream meanwhile to satisfy current demands.

At latest report both Ecuador Oilfields Limited and Anglo-Ecuadorian were waiting for governmental decree allowing a slight increase in the price of refined products on the domestic market. Through several increases in the prices of crude and products in world markets, the price of products to domestic consumers has remained frozen by governmental decree. In this same decree, issued in the middle of July, 1947, the government increased the royalty payments to be made by the companies on crude oil and natural gasoline, saying that increases in world crude oil prices should be passed on in the form of royalty. It has been more and more evident that, while increases in royalty have not been onerous, the inability to raise prices on refined products is a burden on the supplying companies since they said domestic prices were below cost.

Applications for upward revisions of the refined product prices were reviewed by an arbitration board after refusal by the government agency concerned in such matters. The board recommended a slight increase during last June, which required supplementary decree by the provisional government, and later awarded an additional increase taking into account the increased wages brought on by the strike. Thus far neither of the recommendations has received the necessary government action.

Dollar Shortage Hampers Brazil's Oil Economy

By A. L. BURNS
Executive Vice President and General Manager, World Oil

THESE OBSERVATIONS on the Brazilian economy, especially with reference to petroleum, were made by the author during a recent visit to Brazil and other South American countries.

THE ultimate development of Brazil's potential oil resources, and the building of a sound domestic petroleum economy to bolster an otherwise sound general economy, is being hampered by a combination of circumstances, not the least of which is a shortage of dollars. Other contributing factors include the current inability of government, private industry and public opinion to agree on a long-range petroleum policy which might result in granting concessions under which foreign capital may participate in all phases of the industry.

Brazilian oil production and refining are government functions, administered through Conselho Nacional do Petróleo of which Dr. João Carlos Barrato is president. He reports directly to the President of Brazil. The Conselho is unable to pursue exploratory work, drilling, building refineries to the extent desired to make Brazil self-sufficient insofar as oil is concerned, because of the lack of dollars. Refining capacity of the nation at present is only about 2300 barrels per day. A 2500-barrel plant is being built at Bahia and plans have been drawn by Foster-Wheeler Corporation for a 3000-barrel plant at Ipiranga, but it is not under construction. Three other plants are planned—one of 20,000 barrels, another 10,000 and still another 45,000. Plans are even being drawn on part of these refineries, but the plants cannot be erected in the immediate future because of lack of funds.

It is estimated that there are now 300,000 motor vehicles in operation in Brazil. Consumption of petroleum products has about doubled in the past three years. Today it is necessary for Brazil to import more than $100 million worth of petroleum products per year, which is a serious drain on the dollar economy. Not only has there been a tremendous increase in the use of motor fuel, but diesel locomotives have been put into operation and diesel light plants have been built. The country is making progress in the building of roads which, of course, will add to the necessity for additional petroleum. Imports are increasing and the government is deeply concerned because of the drain on dollars and is planning some means of decreasing usage of gasoline. The authorities do not want to institute rationing, since that would be unpopular, but it is felt that without rationing it will not be possible to cut usage to any great extent.

Dollars Allocated

To save dollars, the purchase of cars made in the U. S. is being discouraged. Most passenger cars now coming into the country are from England. The dollar shortage is so critical that effective January, 1949, steps were taken to control further the import of materials which would require dollars for their purchase. Effective July 1, additional steps for the conservation of dollars were taken. The government is working on an exchange budget and is allocating dollars to be used for certain categories to try to liquidate a dollar deficit of about $120 million that has been past due for some time. Economy of the country, in general, is sound, but the big market for Brazilian goods is Europe, which has a shortage of dollars and also a shortage of goods needed by Brazil. Consequently, Brazil has been forced to buy from the U. S. more goods than it can sell to the U. S.

All of this leads to the belief in well-informed quarters that the general economy is going to exert great pressure on the Brazilian government to do something about the oil situation. It is suggested that if laws were enacted to enable outside capital to come into Brazil that oil production could be developed to stop the heavy drain on dollars, and in addition, probably provide dollars from export. The *Correio da Manha,* one of the leading newspapers of Brazil, in an unsigned front page article June 26, opened what informed observers believe to be the beginning of another episode in the general petroleum problem. This was the one responsible paper to attack the government last April for the part it played in favoring the private petroleum concessions (when all other responsible papers defended it) which arose as a result of the charges made to Congress by Socialist Deputy Hermes Lima.

The June 26 article may possibly be part of a political attack on the government in view of the fact that it is a U.D.N. paper. If this is true, there may be another "petroleum scandal," under-

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taken for essentially political motives. The article states that the newspaper has planned to reveal all the facts in clear and documented figures to contribute toward the objective of creating a refining industry on Brazilian territory by means of arousing public opinion and forcing the government to act in this direction. In general terms, it states that the country needs a refining industry in order to save many millions annually now being paid to the marketing companies; that a natural way of developing the industry is to install refineries before there is large scale exploration; that Brazil is the only large country that has not yet established a refining industry and, therefore, remains in an inferior position, and that the refining industry will contribute toward the exploration and discovery of petroleum. It states that the government embarked upon its present policy, concerning petroleum, through Decree-law 395 of April 29, 1938, by which the state declared to be a public utility all that referred to the production, importation, and exploration of petroleum, as well as the construction of pipe lines and refineries. The article refers to what was called the "Dutra Solution to the Petroleum Problem" of last fall which provides for private national refineries to exist within the country. It recalls the charges made by Deputy Hermes Lima, whom the *Correio da Manha* supported, stating that the charges still held and that the government had taken no steps in the matter.

It states that there is something worse than a "petroleum scandal": inhibition and lack of government action on the problem. It states that three solutions are open to the government—absolute state monopoly, absolute free enterprise by private initiative, or the mixed solution which permits state and private refineries to exist, the latter by means of concessions granted by the state.

The article states that there are two obstacles to the petroleum problem in general and to that of refineries in particular. These are the reactions of the Communists and the reaction of the "trusts" which are joining for their separate reasons. The Communists do not wish a country economically strong and rich outside the orbit of Soviet expansion and the "trusts" do not want Brazil to have refineries because they would lose its market.

Brazil has an area about one-ninth larger than the U. S. Its population is approximately 46 million, most of the population being along the coast and along the Amazon. The interior is sparsely settled. There are a few highways and railroads. The terrain is rugged and consequently exploration will be very expensive. It is the hope of some Brazilians that outside capital can be induced to produce oil, but the government would handle the refining. It is questionable whether oil companies would be willing to take the risk of development and be at the mercy of the government in the matter of prices for its products. Gasoline is selling at 1.85 cruzeiros per litro. The official exchange rate, at present, is about 18 cruzeiros for $1, but money-changing places in Rio are giving 31 cruzeiros for one U. S. dollar. This would make the present retail retail price of gasoline approximately 22.5 cents U. S.

There is a strong feeling in Brazil against the oil exploration by outside interests. As a matter of fact, on many concrete walls will be found this inscription . . . "O Petróleo Nosso Brasil" . . . which means the petroleum belongs to Brazil.

Nevertheless, we are informed that the exploratory work being done is far from adequate and that where there are a few exploration crews at work, there should be many times the number at present engaged in this work in order to accomplish anything worthwhile in the next several years. It is all very well for Brazilians to say "the petroleum is ours," but getting the money and equipment and getting the know-how to develop it is a problem that has not been solved within the country and it is felt that Brazil will finally have to make terms through which outside capital can be induced to come into Brazil and help develop its petroleum resources.

With the 300,000 vehicles operating in Brazil (most of them must be in Rio de Janeiro) there is still not a sufficiency of transportation during rush hours. It is almost impossible for one to catch a public conveyance between the hours of five and seven. Street cars, busses, lotacãos, jitneys and taxicabs are all full and the pedestrian anxious to get home waits in vain for some sort of a conveyance. Long lines form to catch busses.

Brazilian labor laws are not good. It seems that labor got nothing for a very long time and when the pendulum swung it went too far in the other direction. However, the author was told that the labor laws are not good even for labor because they can be evaded, that they were passed to look tough but are really not so good for the laboring man as less stringent laws that would be workable. If a man has been working for a concern for a few years, it is very expensive to let him go, as it is necessary to pay him one month for each year he has been working, and also give him one month's notice. If a man has been working for five years, for instance, it would be necessary to pay him for six months in order to discharge him. After ten years, it is almost impossible to get rid of a man. So the result is that after nine years, if he is not considered "top drawer," he is fired. Despite all this, U. S. concerns find it possible to do business with these laws, as some of them who have been operating there for a number of years are adding to their operations.

$6 Million Refinery Will Be Dominican Republic's First

The Dominican Republic has issued a decree calling for construction of a $6 million refinery designed to take care of all the requirements of the country and eventually to make Dominica an oil-exporting nation. Equipment manufacturers are now negotiating with International Industrial Consultants, S.A., of Caracas, Venezuela, which will be in charge of the project.

First installations will be a 5000-barrel a day plant but authorization covers construction of a 25,000-barrel a day refinery which will be built at Ciudad Trujillo at a cost of $15 million. This will be the only refinery located along the Atlantic between the huge installations in Venezuela and the West Indies, and the region around New York.

The refinery will be an important step in Dominica's industrialization program which will also include a new sugar mill of 30,000 tons capacity and an extra hydroelectric plant. The site for the refining plant has been selected and construction of port facilities, warehouses, docks and tank farms will begin at once.

Dominica's present petroleum consumption is about 2500 barrels daily with a prospective requirement of 4500 barrels by 1953. Thus when the refinery is finally completed, Dominica will have an export capacity of about 20,000 barrels daily.

Creole's Crude Output Down 14 Percent from Last Year

Creole Petroleum Corporation's net crude oil production in Venezuela for the first six months of 1949 totalled 98,374,767 barrels, an average of 543,507 barrels a day, as against 114,673,375 barrels, or 630,073 barrels a day, for the corresponding period of 1948. The decline is around 14 percent. Creole produces about one-half of all the oil produced in Venezuela.

Current production by Creole is again approaching 600,000 barrels a day.

A. T. Proudfit, Creole president, explained that the company's lower earnings this year reflect not only the cutback in crude production but also the sharp drop in the price of heavy oil from $2.46 a barrel in November, 1948, to a low of $1.15 in May, 1949.

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Designed on same three-jaw principle that has proved so efficient on larger Web Wilson Tongs.

Fewer parts cut initial cost—make repair and replacement extremely economical.

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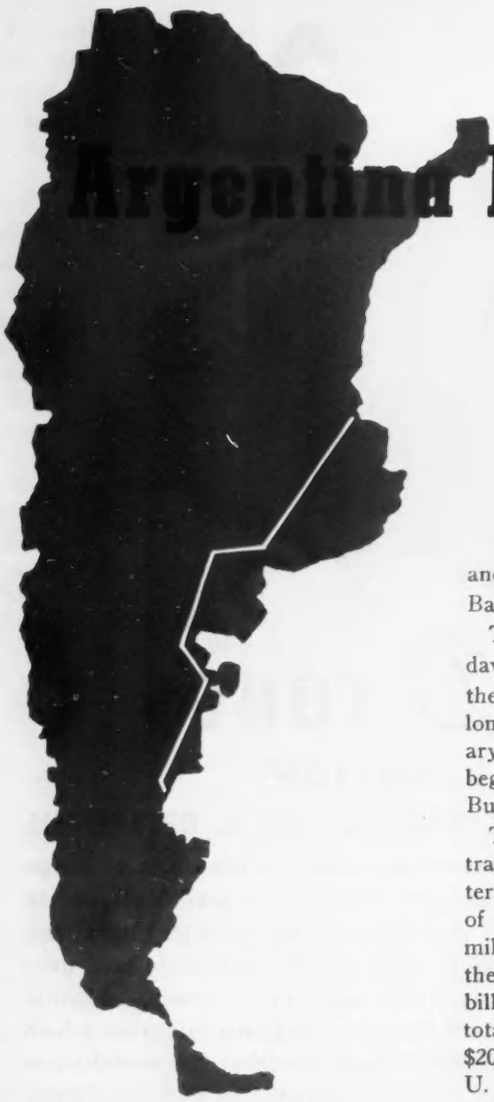


Argentina Line Nears Completion

By HENRY OZANNE
Staff Writer

ARGENTINA'S "gasoducto," the natural gas pipe line from Commodoro Rivadavia to Buenos Aires, now lacks only 100 miles to complete its 1100-mile length, and will be in operation late in November. President Peron will head ceremonies marking the formal opening of the line, the largest in South America and one of the largest in the world.

The "gasoducto" is a key factor in Argentina's five-year industrialization program. In addition to linking the capital with the country's producing field (reserves of which are estimated from one-half trillion to one trillion cubic feet), the line will serve 14 towns along its route with a combined population of 220,000. The line will aid in the expansion of Argentine industry and will go far toward making Argentina independent of fuel imports. President Peron calls the line the "spinal column" of Argentina's industrial area and estimates that by reducing oil imports 12 million barrels a year, the project will save his people 500,000 pesos a day.

The line will transport 35 million cubic feet of gas daily to Buenos Aires and to intermediate points, such as Bahia Blanca.

The gas surplus at Commodoro Rivadavia was found when oil was discovered there in 1907, and while a pipe line was long discussed, it was not until February 21, 1947, that work on it actually began, in the suburb of Llavallol, near Buenos Aires.

The Argentine State Gas Administration, using U. S. equipment and material, built the line as far as the village of General Coneso, a distance of 775 miles. An Italian company is completing the job with pipe rolled in Italy from billets bought in the U. S. Of the line's total cost of about $35 million, more than $200,000 was spent the first year for U. S. equipment and supplies.

The geography of Argentina has posed many problems in laying the line. At the crossing of the Rio Negro, southern boundary of the province of Buenos Aires, the line was spliced so that one branch is buried a yard deep in mud while the other is suspended across the surface. On the open pampas, temperatures of 120° F. were encountered, and so lacking was any communication system that carrier pigeons were used. Food and water were flown to the construction crews by helicopter.

Types of Pipe

The line consists of two types of pipe with the following specifications:

	Type 1	Type 2
Exterior diameter	10 in.	10.75 in.
Wall thickness	0.226 in.	0.25 in.
Weight	23.65 lb./ft.	28.02 lb./ft.
Average length	32.8 ft.	32.8 ft.
Minimum tensile strength	71,115 psi	59,737-69,693 psi
Minimum limit of elasticity	42,699 psi	34,989-41,958 psi
Hydrostatic test	1137.8 psi	1137.8 psi
Elongation	18%	18-20%
Method of fabrication	seamless	longitudinal weld

Joints are electric welded with the use of an inside lineup clamp which is hydraulically operated. A minimum of two beads is run in addition to the stringer bead when joints are welded by the rolling method. A boom tractor handles the pipe which is roll-welded on dollies on the right-of-way. The two joint sections are added to the line by eight "all-position" or "bell-hole" welders working in pairs. When the stovepipe method is used, a minimum of three beads are run.

Eight 250-amp welding units, each towed by a jeep, were used in work on the forward end of the line. Several 400-amp truck-mounted units were available for utility operations.

One method of inspecting welds consists of establishing in the metallic part inspected an intense magnetic field, sprinkled with magnetic oxide iron. If an invisible flaw exists, a distortion of the magnetic field is produced, free magnetic poles appearing at the surface of the weld. The oxide of iron adheres to the magnetized area revealing the flaw.

The pipe is coated and wrapped as protection against corrosion, although coating is done only in areas where corrosive conditions have been indicated.

The pipe is "crowded" into the ditch and a slack loop is left up on a skid every 547 yards to be lowered-in during a cool period of the day. Block valves are installed about every 18.6 miles to permit isolation of sections without interruption of service, as may be necessary for repair work.

When finished, sections between block valves are submitted to two tests to determine the tightness of the welded joints. The first test is by applying an air pressure of 256 pounds per square inch to the 18.6-mile sections and leaving for a 24-hour period. The second test is at a pressure of 1067 psi, also for a 24-hour period.

Two parallel lines of pipe are installed at river crossings to insure uninterrupted service in case of damage.

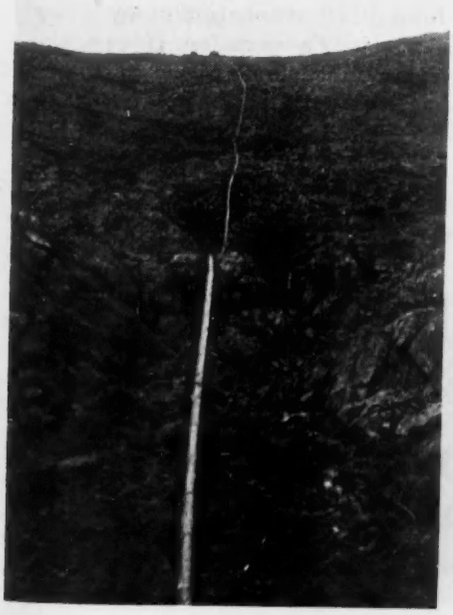
TOP LEFT: Moving a [illegible] a flooded area.

TOP RIGHT: Protective equipment operating in a flooded zone.

RIGHT: Cleaning pipe and applying primer paint.

LOWER LEFT: The gas line in the mountains of Tehuantepec.

LOWER RIGHT: Tractor working in flooded area of the Central Pringles-Bahia Blanca section.



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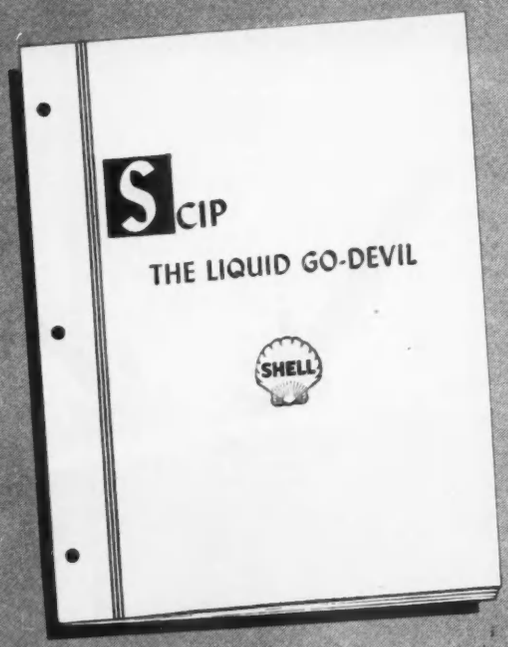

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Philippines

to Invite New Operators

By DR. DEMETRIO ANDRES

ALTHOUGH oil has been known since the days of Spanish rule to exist in the Philippine Islands, sporadic activity over many years has failed to establish commercial production. Now, with possibility that a new petroleum law will make exploration in the Philippines more attractive to outside capital, it is hoped by authorities that the immediate future will see a revival of interest on the part of the larger units of the industry. Such interest, under a petroleum law with liberal provisions for freedom of operation, should result in rapid exploration of the Republic's petroleum possibilities. The new law is now before the legislature, having already been approved by the Philippine Oil Commission.

Currently only one company, the Philippine Oil Development Company (formerly the Far East Oil Development Company) is doing any exploration work on leases acquired prior to the war. In the Daanbantayan area in the northern part of the island of Cebu a test was drilled which reached the basement complex at 9950 feet late in 1947. This is a record depth for drilling in the Philippines, and the well was abandoned in spite of indications of oil in several horizons because it could not be brought in as a commercial producer. Since drilling equipment has been moved to the island of Luzon the company has continued geophysical work which is still in progress, and this survey is reported to have revealed interesting sub-surface conditions somewhat removed from the location of the first hole. The company plans to drill another well upon completion of the survey.

The rig was later moved to Bondoc peninsula on Luzon island for exploration of the company's concession in that area. Encouraging showings were found despite the fact work was delayed by mechanical drilling difficulties. The first well was spudded July 14, 1948, stopped on August 25 after reaching 1372 feet, and the hole abandoned. The rig was moved to another location 1000 feet to the west of the first and drilling started again early in October. Difficulties were again encountered with the walls of the hole. However, in this well it was possible to go as deep as 2360 feet, and to make some tests of shows found at 1750-2250 feet. On one of these tests the well flowed at a rate of 250 barrels a day for a short while. Early this year the rig was moved 600 feet north, and at last report was drilling in relatively shallow formations with no troubles encountered.

During Spanish times several attempts were made to develop oil production in the Philippines. Several shallow wells were drilled near Toledo, in the central part of the island of Cebu. Several gallons of oil a day were extracted from these wells. A small asphalt enterprise was operated on Leyte for some time on a non-commercial scale.

In 1922 Richmond Petroleum Company drilled a number of wells on Bondoc peninsula in Quezon (Tayabas) Province, but only one went below 5000 feet. Natural gas and showings of oil were found but the company went out of operation without these having been developed to commercial volume. In 1934 Standard-Vacuum Oil Company secured a few leases but was able to undertake only a preliminary study of the islands before restrictions were imposed.

Granting of leases under Act No. 2932, known as the Petroleum Act, was suspended in 1939. The government assumed that the law was insufficient or unattractive, since although it had been on the books since 1920 no major company had carried out a really serious search for oil and no oil of commercial value had been discovered or developed. The suspension was made preparatory to the formulation of a new policy which the government hoped would stimulate interest.

During the period of suspension of the Petroleum Act, and prior to the outbreak of the Pacific War, the government, in order to determine for itself the prospects for oil in the Philippines, conducted through the National Development Company, a government-owned corporation, a petroleum survey of the islands. Detailed surveys were made in Luzon, Leyte, Cebu and Panay with extensive reconnaissance on other islands. From these surveys it was found that there are four principal sedimentary basins in the islands believed to be the best prospects for oil development. These are the Cagayan Valley, the Central Plain of Luzon, the Iloilo Basin of Panay, and the Cotobato Valley in Mindanao. There are other places where oil seepages are found and, if favorable geologic factors are present, may be con-

About the Author

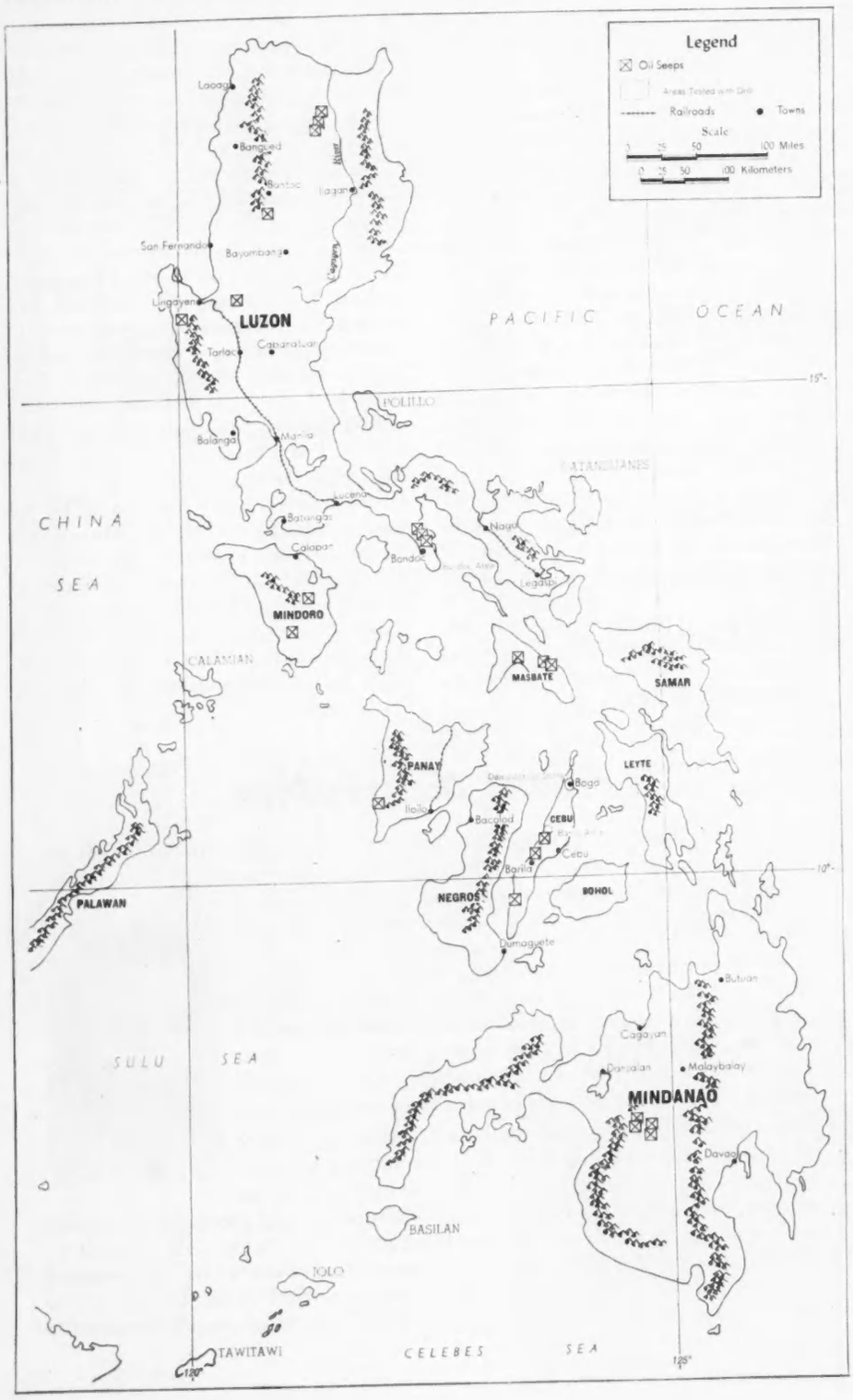
DR. DEMETRIO ANDRES, director of the Philippine Bureau of Mines, and executive secretary of the Philippine Oil Commission, is a surveyor, lawyer and mining engineer and has been in charge of administration and disposition of the mineral resources of the Philippines since 1924, when he was appointed chief of the Mineral Lands Administration and Survey division of the Bureau of Lands. He organized the Bureau of Mines after it was created in 1936 and reorganized it in 1945 after the Pacific war, during which the bureau was totally destroyed and practically all its records burned. He was first appointed officer-in-charge and later director and prepared the laws creating the Bureau of Mines and the Mining Act. He has served as a member of the Board of Examiners for Surveyors, lecturer on mining laws in the University of the Philippines, and professor on mining laws and surveying in the Mapua Institute of Technology. As a result of investigations in the U. S. and other oil producing countries he has prepared a comprehensive Petroleum Law which was approved by the Philippine Oil Commission and is now pending before the Congress of the Philippines for legislative action.

sidered excellent prospective areas. These are Bondoc Peninsula, Southern Mindoro, the northwestern peninsula of Leyte and the island of Cebu.

Tertiary sedimentary formations are present in all these areas, some of which have been found to be equivalent to oil-bearing horizons of the East Indies, the nearest oil producing area to the Philippines. While the formations of the East Indies range from 20,000 to 30,000 feet in thickness, those of the Philippines do not exceed roughly 15,000 feet. Since East Indies production comes from fairly shallow wells, the Filipinos do not consider this a serious drawback.

The Cagayan Valley in Northern Luzon has an area of about 10,000 square kilometers (2,471,000 acres). The valley is a syncline, but there are folds which may favor the accumulation of oil. Other sub-surface structures may be determined only after a geophysical survey of the area has been made, since the outcrops are obscured by a thick burden of alluvium. Oil seepages have been reported in various places in the valley and should encourage early prospecting of the area as soon as the new oil law is in effect.

The Central Plain of Luzon is one of the largest plains in the archipelago, having an area of about 13,000 square kilometers. There has not been enough geological work done in the area to support a definite statement as to outlook for possible oil, but it is believed that with detailed study, especially in the foothills of the western Cordillera, favorable structures are to be expected. As in the Cagayan Valley, a geophysical survey should be made to determine the subsurface structures.



Gas Emanations

Gas emanations have been reported in various places in the Iloilo Basin on Panay Island. This region has an area of approximately 2500 square kilometers, and from the preliminary studies already made it is expected that structures favorable for oil accumulation may be found, especially on the western side where it rises into the mountain range.

Several oil seepages have also been reported in the Cotabato Valley in Mindanao, but there is very little information available on the area aside from sedimentary formations near, or in contact with, volcanics. In some opinions this area of about 7000 square kilometers may be one with some of the best potentialities in the Philippines.

The Bondoc Peninsula, the northwestern peninsula of Leyte, and the island of Cebu are among the best known regions in respect of petroleum possibilities. Not only are there numerous oil seepages, but it is in these areas that most of the geological investigation has been made in the past, and most of the drilling has been done. A number of structures have been outlined and several have been drilled. However, it appears that more study is necessary in these as in other areas and in order to obtain more accurate information the previous work should be supplemented with more geophysical work.

In Southern Mindoro, at San Jose, oil seepages have been known for some time but nothing further has been done to determine the possibility of finding commercial production in the vicinity.

These findings will perhaps contribute to the encouragement of U. S. major oil companies to participate in the exploration, development and exploitation of the islands' oil resources.

With the end of formulating a new oil policy, the Philippine Oil Commission was created pursuant to Joint Resolution 5 of the Philippine Congress, and to implement its report to the President, an oil mission was sent to Europe, the U. S. and Mexico to study trends in petroleum legislation, and the most modern practices in the petroleum industry. The mission was composed of Sebastian C. Moll, Jr., chairman of the Committee on Mines of the Philippine House of Repre-

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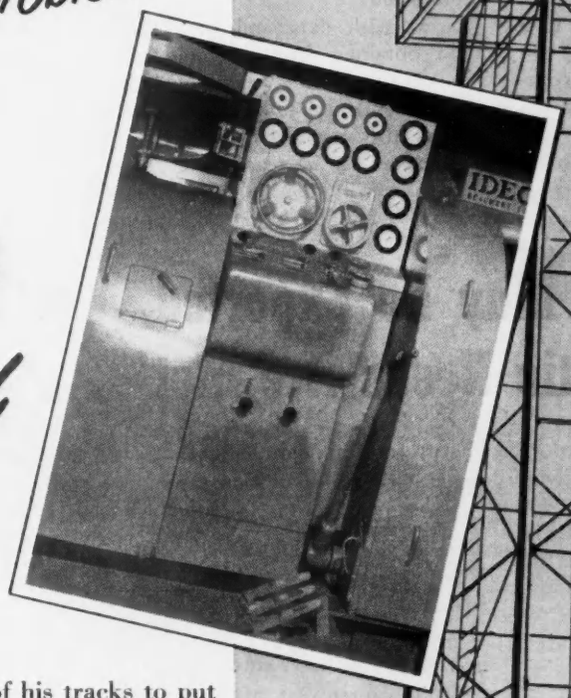

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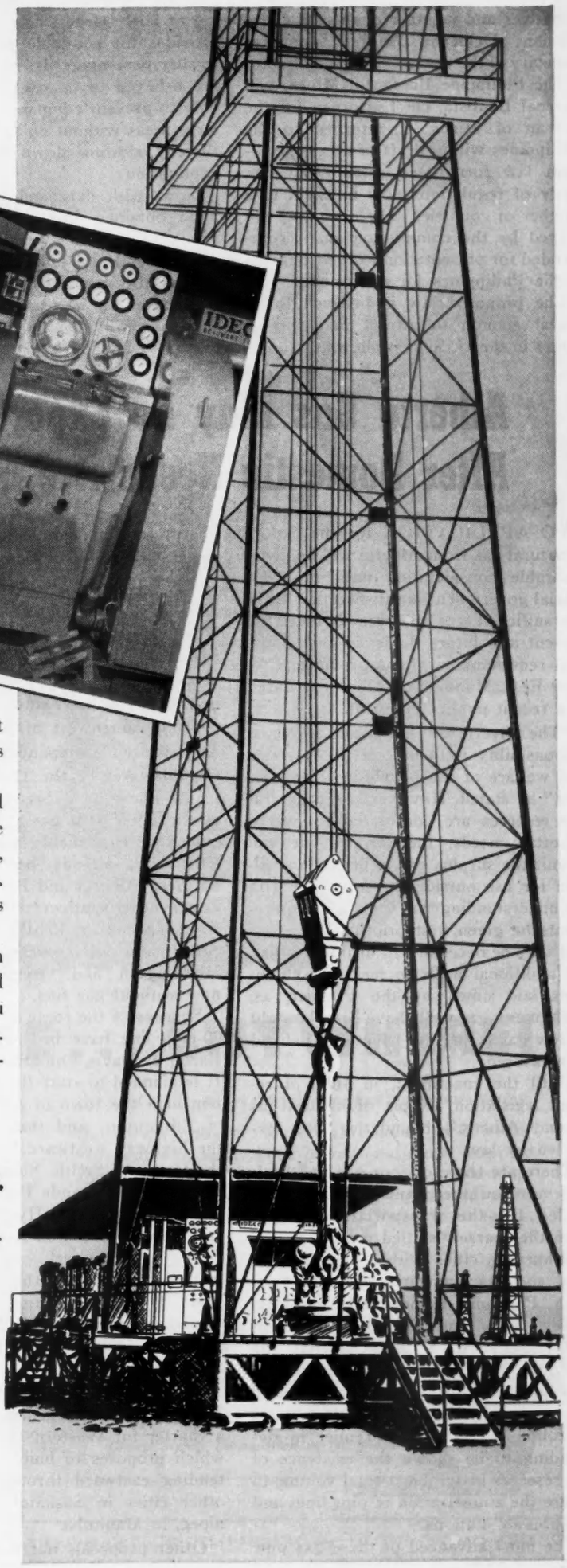

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sentatives and member of the Oil Commission; Demetrio Andres, executive secretary of the Commission and director of the Philippine Bureau of Mines; and Pascual Bautista, chief attorney for the Bureau of Mines. It returned to the Philippines with a draft of a new petroleum law formulated after exhaustive study of regulations now in effect in a number of countries. The draft was approved by the commission and recommended for presentation to the Congress of the Philippines for enactment.

The proposed law is believed to be liberal enough to attract major companies in the U. S. as it allows the holding of fairly large tracts of acreage and provides for equitable surface tax and royalty percentage. Its work obligations are believed to be reasonably designed only to prevent companies from holding large areas without doing any work and thereby slowing down the process of exploration.

Now, with data and information on hand obtained from a geological survey of the islands conducted by the government, and under the liberal provisions of a new petroleum law soon to be enacted, it is reasonable to expect that there will soon be more determined efforts to find oil in the Philippines.

Alberta Gas May Be Exported After Domestic Needs Are Met

NO APPLICATION for the export of natural gas from Alberta will be given favorable consideration until the provincial government is satisfied that there are sufficient gas reserves to meet the present and future domestic and industrial requirements of the province, Premier E. C. Manning of Alberta declared in a recent public statement.

"The government's first and foremost responsibility is to protect the interests and welfare of the people of this province," he stated. However, when natural gas reserves are considered to exceed Alberta's needs, the government will permit the surplus gas to be made available for use outside the province, with the understanding that Canadian requirements be given first priority.

It may be necessary to drill more than 100 additional wells to meet the conditions laid down by the Premier, as, while many gas wells have been brought in, few gas reservoirs have been defined or measured.

Until the enactment, in July, of revised legislation, export of natural gas beyond Alberta's boundaries was forbidden by law.

There are three or four gas line projects now on the planning boards, intended for the transportation of gas from the sparsely-settled prairies to the coal-burning cities within pipe line radius, such as Vancouver, Seattle, Spokane, Portland, Regina and Winnipeg.

New York and Toronto investment bankers, and U. S. and Canadian life insurance companies, who are expected to supply much of the capital required for financing these vast undertakings, may line up with the Premier in demanding to be shown the existence of gas reserves in sufficient total volume to assure the amortization of pipe lines and compressor stations.

The most advanced of these gas pipe line projects appears to be that of West Coast Transmission Company, Ltd., of Calgary and Edmonton, which is headed by Frank McMahon, of Pacific Petroleums and Bear Oil Company. These two companies control about 566,000 acres of potential gas-producing lands in the Peace River and Dawson Creek districts, northwest of Edmonton. The Transmission Company has been chartered by Act of the Dominion Parliament. Plans have been drawn for the construction of a gas pipe line system extending from fields, the existence of which has already been indicated in northern Alberta and British Columbia, in a general southwesterly direction toward Vancouver, British Columbia, and Seattle and other cities in the states of Washington and Oregon, which are now without gas fuel.

Surveys of the route for the proposed 30-inch line have been made by Ford, Bacon & Davis, construction engineers. It is planned to start the gathering system near the town of Athabasca, north of Edmonton; and that it will follow the highway westward through or near the towns of Smith, Slave Lake, Faust, High Prairie, Grande Prairie, Wembley, Beaver Lodge, and Hythe, in Alberta, and Dawson Creek, in British Columbia. From Dawson Creek, or its vicinity, the main line will follow the Hart Highway south to Prince George and thence to Vancouver, via Quesnel, Williams Lake, Ashcroft, Kamloops, Princeton, Hope, and Chilliwack.

Another group, headed by Col. Lionel Baxter, of Winnipeg, has also obtained a charter for Western Pipe Lines, Ltd., which proposes to build a gas line extending eastward through Regina and other cities in Saskatchewan to Winnipeg, in Manitoba.

Other proposals not so far advanced include one by Alberta Natural Gas Company, Ltd., of Edmonton, which would build a line from Alberta gas sources south and west to Spokane, and thence westward to Seattle, Portland, and Vancouver.

Canadian Gulf Discloses New Pincher Creek Producer

Canadian Gulf Oil Company's Walter Marr test, about seven miles north and west of its 1948 wet gas discovery south of Pincher Creek, Alberta, has an estimated potential production of 83 million cubic feet of natural gas and 3000 barrels of clear light crude per day, 52 gravity, with a bottom-hole pressure of 4868 pounds per square inch.

The announcement coincided with the arrival in western Canada of 26 ranking officials and directors of Gulf Oil Corporation from Pittsburgh, including Col. J. F. Drake, chairman, and S. A. Swensrud, president.

Earlier tests on the well included water from a total depth of 12,768 feet. The well was plugged back successively to a present depth of 12,473 feet, and is producing from about 200 feet of Madison lime.

The Pincher Creek discovery, which was completed in June of last year, showing about half as much light oil or distillate and about two-thirds as much gas from an equivalent depth, is just east of the small village of Twin Butte, which is 15 or 20 miles north of Glacier National Park in Montana.

Structurally and otherwise, with particular reference to the type of gas and distillate found, the newly-productive anticline bears a striking resemblence to the older field at Turner Valley, near Calgary, where oil in great volume was found down-flank following several years of activity during which production was limited to a light straw-colored distillate, recovered from the gas-cap atop the structure.

The official party from Pittsburgh also investigated the Canadian subsidiary's second important oil discovery in the Devonian lime, at a depth slightly below 5300 feet, near the town of Stettler, which is about 50 miles east of the town of Red Deer, on the Calgary-Edmonton highway, about midway between the two rival oil cities of Alberta. Canadian Gulf's Ellis 1, the discovery well at Stettler, found about 50 feet of porous oil-bearing lime pay in each of the D2 and D3 zones, which are productive of oil in great volume at Leduc, Woodbend, and Redwater. This well is variously reported as having a potential of 1500 to 3000 barrels of 30 to 32-degree oil per day, and gives promise of developing into an oil field of importance.

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Conservation Board Controls Alberta's Production Allowables

THE Petroleum and Natural Gas Conservation Board of the Province of Alberta held a public hearing late in July to receive testimony regarding new allowable rates of production. These are to be promulgated under the new oil and gas laws of that province, which were completely re-written in a recent "oil and gas session" of the Provincial Legislature.

Broad new powers were granted to the Conservation Board for the control of all phases of oil and gas production, including proration as to market demand, proration as between fields and pools within the province, and restriction of production to prevent physical waste, etc. Also, the board now has power to compel repressuring, recycling, etc., and to dictate other techniques of production.

E. D. Wilson of Calgary, petroleum engineer representing Imperial Oil, Ltd., read a paper in which he suggested that production from the Leduc-Woodbend Field should be restricted as follows:

Zone	Barrels per Well per Day
D2	40 to 50
D3	70 to 100

Other operators present at the hearing asserted that this proposal took them by surprise, and requested the hearing be postponed so as to give them additional time in which to prepare engineering studies, etc. These requests were granted. The board took no action, but let it be known that a second meeting may be called for a re-hearing in September.

Heretofore, or since local production surpassed accessible refining capacity some weeks ago, restriction of daily average output has been accomplished at the instigation of the purchasers, Imperial Oil, Ltd., and British American Oil Company, Ltd., by voluntary cooperation among producers at Leduc, Woodbend, and Redwater.

Effective August 5, Imperial Pipe Line Company, as principal purchaser in these flush fields, announced an increase of approximately 10 percent in the daily average rates, per well, at which oil will be accepted for purchase, as shown in Table 1.

This 10 percent increase in pipe line purchases, presumably, is representative of a gain in available storage capacity, following recent expansion and reconstruction of Imperial Oil's refining facilities at Edmonton, Alberta, and Regina, Saskatchewan.

British American, the only other major purchaser active in these new fields, is buying 100 barrels per well per day from producers in the Redwater field, similar daily amounts from the D3 Zone of the Leduc-Woodbend field, and 70 barrels per well per day from D2 Lime and Lower Cretaceous sands wells in the latter area.

Posted prices for light oils, such as are produced from these new fields, now range from $2.68-$2.78 per barrel at Redwater to $2.95-$3.05 per barrel at Leduc and Woodbend, with slightly higher prices ruling on a gravity basis for higher gravity oils produced at Turner Valley, an older field producing gas and light oils with established market outlets in the refining and consuming center of Calgary.

Imperial Pipe Line Company has a 25-mile gathering line serving the Leduc-Woodbend area, with a loading rack on the railway line at Nisku, south of Edmonton, and with its northern terminus at Imperial Oil's new 15,000-barrel refinery at Edmonton. Alberta oil is moved by rail to other refineries at Calgary and Regina.

Refining Capacity of the Prairie Market

The Prairie Market is defined by the Rocky Mountains on the west, where high railroad freight rates obtain; by unpopulated regions on the north; and by great distances and high freight rates on the east; and by the virtual absence of refining facilities in contiguous regions of the U. S. Refinery facilities presently accessible to Western Canadian oils, as determined by rail freights, are as follows:

Company and Location		Capacity Barrels per Day
Imperial Oil, Ltd.		
Edmonton	15,000	
Calgary	10,000	
Regina	15,000	40,000
British American Oil Co., Ltd.		
Calgary	6,000	
Moose Jaw	6,000	12,000
North Star Refinery, Winnipeg		4,000
Anglo Canadian & Home Oil Co., Brandon, Manitoba		2,000
Co-operative Refinery, Regina, Saskatchewan		2,000
Hi-way Refining Co., Ltd., Saskatoon, Saskatchewan		2,000
Gas & Oil Products, Ltd., Turner Valley, Alberta		2,500
Total Maximum Daily Throughput Capacity		76,500

However, as these plants are not operated as maximum throughput capacity, on a routine basis, their aggregate daily crude requirements are somewhat less than the total reflected above.

Some interesting observations were made in the Wilson paper, as follows:

"Our estimate of the ultimate recoverable reserves from the D2 Zone (at Leduc) is.....45 million barrels

"Our reservoir engineers have estimated that the ultimate recoverable oil in the D3 Zone amounts to approximately .....197 million barrels

Thus, the estimated total is.....242 million barrels

". . . the (D2) pool is now only about 20 percent developed . . ." and ". . . the D3 (Zone) is about 35 percent developed."

"D2 Zone . . . assumed productive area of.....15,000 acres."

"D3 Zone . . . assumed proven area of.....21,900 acres."

Analyzing these figures by the application of the Conservation Board's 40-acre spacing rule, it is found that 375 wells may be required fully to develop the upper zone, with 547 wells necessary to be drilled to the lower. Thus, it would appear that about 922 wells may be required for complete development of the Leduc field. Less than 300 have been completed.

"In order to protect the gas cap of the D3 reservoir by restricting the production of free gas," Wilson continued, "it is strongly recommended that withdrawals from the D3 Zone be placed on an equal gas volume basis. We would suggest that the maximum gas-oil ration be 1100 cubic feet per barrel, which is 50 percent above the solution gas-oil ration (733) by flash liberation of D3 Zone reservoir oil."

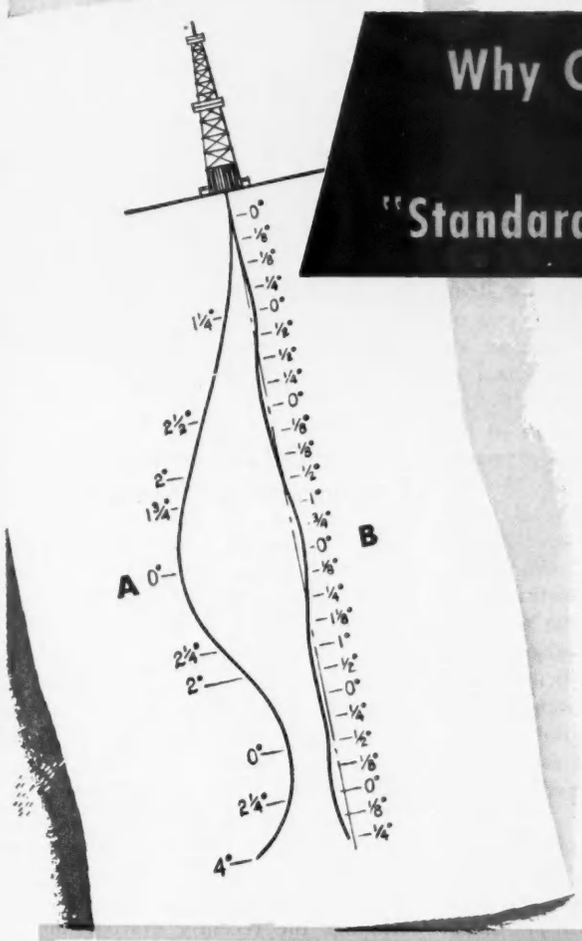
TABLE 1

PIPE LINE ALLOWABLES
Edmonton District

Field	*Former Conservation Allowables	Pipe Line Acceptances, per Well
Leduc-Woodbend		
D2 Zone	100	75
D3 Zone	150	105
Lower Cretaceous Sands	—	75
Redwater	300	125
Golden Spike	450	300
Whitemud	—	75

* Expired July 31, 1949. New rates may be fixed following a hearing in September.

Why Controlled Vertical Drilling with a TOTCO is "Standard Practice" all over the world



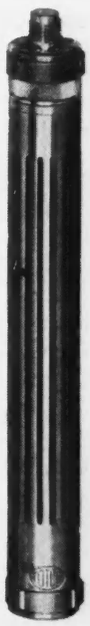
A straight hole is quicker, easier and cheaper to drill than a crooked one. It's a trouble-free producer, too.

The illustration at left shows why this is so. Look at hole "A." Looks like the first inclination reading was taken too late and subsequent readings were too few and too far apart to guide the driller in drilling a vertical hole. That dogleg is a natural for stuck casing or keyseating, isn't it? Efforts to correct it have only made matters worse. Chances are that there'll be a nasty fishing job in this hole before long.

Now look at hole "B." On this well the driller took frequent inclination readings, and used this information in determining the correct rotation speed and weight on the bit for drilling ahead. Not much room for trouble here, is there? And that's where Controlled Vertical Drilling really shows a substantial saving. Because trouble costs money. Stuck casing, keyseating, twist-offs, fishing jobs, backing up and re-drilling—any one or any combination of these results of crooked hole can mean the difference between success and failure from a profit standpoint.

When you think it over, can you *afford* to drill anything but a vertical hole?

The TOTCO RECORDER



Here's the instrument that can tell you exactly what's happening in the hole—the TOTCO Recorder. With TOTCO you can get an accurate, dependable reading of inclination *at any time*. Any member of the drilling crew can handle the TOTCO, and it takes only a few minutes to run it in the hole. And the driller can immediately read and correctly interpret the record the TOTCO produces.

Yes, the TOTCO Recorder is the kernel of Controlled Vertical Drilling. TOTCO Records, accurate right down to one-eighth of a degree, are the only safe guide for determining the correct drilling weight and rotation speed. You can take *frequent* readings, too, with any one of the 5 easy ways of running the Recorder.

Totco Equipment is leased or rented in the U.S.A.; sold for export only.

TOTCO supplies Go-Devils and accessory equipment for running the TOTCO Recorder on sand line or measuring line and in conjunction with wire line core barrel retrieving equipment; for dropping freely in the drill pipe; and for running in the bailer in cable-tool-drilled wells.

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Suez Canal is Key Position In Middle East Oil Transport

THE U. S. is becoming increasingly dependent on the Suez Canal because of this country's importation of larger quantities of oil from the Middle East, according to an analysis made recently by Robert W. Leavitt, of the Transportation and Communications branch of the Office of International Trade, Department of Commerce. Tonnage of shipping moving through the Suez Canal in 1947 and the first six months of 1948 exceeded any previous record. In 1937, peak pre-war year, 36.6 million net registered tons moved through the canal, but for the first six months of 1948 this had increased to 25.9 million tons, a figure which in itself is an increase of 37 percent over the same period of 1947.

Historically, British vessels and British trade have been the largest users of the canal, constituting 62 percent of the trade volume through the canal in 1920, and 47 percent in 1947. "Before World War II," Leavitt writes in his analysis published in Foreign Commerce Weekly, "U. S. flag vessels and American foreign trade constituted a relatively small part of total Suez Canal traffic. In the ten-year period 1927-1936, vessels flying the American flag constituted on the average 6.2 percent of the total net tonnage of Suez traffic. During these years an average of 1,900,000 net registered tons of American shipping moved through the canal annually, and an average of 1,900,000 long tons of cargo moving to and from the U. S. passed through the canal."

The chief characteristic of American trade moving through the Suez Canal since World War II has been the large north-bound movement of petroleum from the Persian Gulf. Petroleum products had not moved in the north-bound U. S. import traffic of the canal before World War II. Yet, says Leavitt, in the first six months of 1948, a total of 840,000 tons of petroleum products moved northward through the canal bound for U. S. ports. Preliminary figures for the second half of 1948 show this volume is increasing. On a 12-month basis, U. S. petroleum imports alone through Suez in the first half of 1948 would exceed the 1929-1936 annual average of 1½ million tons of all commodities moving to the U. S. through the canal.

TABLE 1
Vessel Traffic of the Suez Canal, 1920, 1937, 1947, 1948
(1,000 net registered tons)

FLAG	1920 Net Tons	1920 Percent of Total	1937 Net Tons	1937 Percent of Total
British	10,839	61.7	17,254	47.3
Japanese	1,602	9.1	967	2.6
Netherlands	1,426	8.1	2,800	7.7
French	775	4.4	1,820	5.0
American	724	4.1	562	1.5
Italian	606	3.5	5,866	16.1
German	15	.1	3,313	9.1
Norwegian	172	1.0	1,657	4.5
Panamanian	...	...	40	...
Other	1,415	8.0	2,252	6.2
Total	17,575	100.0	36,491	100.0

FLAG	1947 Net Tons	1947 Percent of Total	1948 (First 6 Months) Net Tons	1948 (First 6 Months) Percent of Total
British	17,276	47.2	9,786	37.7
Japanese	...	...	...	...
Netherlands	2,387	6.5	1,582	6.1
French	1,759	4.8	1,426	5.4
American	7,302	20.0	3,755	14.4
Italian	1,650	4.5	1,562	6.0
German	...	...	...	...
Norwegian	2,667	7.3	2,289	9.1
Panamanian	1,599	4.0	2,311	9.2
Other	1,937	5.7	3,198	12.1
Total	36,577	100.0	25,909	100.0

TABLE 2
Petroleum Traffic Through the Suez Canal in the Years 1920, 1937, 1947, 1948
(Quantities in 1,000 long tons)

ITEM	1920 Northbound	1920 Southbound	1920 Total	1920 Percent of Total Traffic	1937 Northbound	1937 Southbound	1937 Total	1937 Percent of Total Traffic
Petroleum	787	263	1,050	6.2	5,705	360	6,065	18.5
Other Commodities	9,942	6,055	15,997	93.8	16,914	9,797	26,711	81.5
Total	10,729	6,318	17,047	100.0	22,619	10,157	32,776	100.0

ITEM	1947 (First Six Months) Northbound	1947 (First Six Months) Southbound	1947 (First Six Months) Total	1947 (First Six Months) Percent of Total Traffic	1948 (First Six Months) Northbound	1948 (First Six Months) Southbound	1948 (First Six Months) Total	1948 (First Six Months) Percent of Total Traffic
Petroleum	5,203	23	5,226	40.2	11,992	48	12,040	55.6
Other Commodities	4,232	3,560	7,792	59.8	5,346	4,267	9,613	44.4
Total	9,435	3,583	13,018	100.0	17,338	4,315	21,653	100.0

Leavitt finds that shipments of petroleum rose from 6.2 percent of the total volume of commodity traffic in 1920 to 18.5 percent in 1937 and to 55.6 percent during the first half of 1948. He says: "In the first half of 1948 northbound shipments of petroleum products totalling 11,900,000 tons consisted of 42 percent crude oil, 32 percent fuel oil, and the remainder was gasoline, paraffin oil and other products.

"Most of this petroleum has been for use in Europe, although increased U. S. imports accounted for 7 percent of the northbound petroleum traffic in the first six months of 1948."

Iranian Oil Agreement Is Deadlocked by Filibuster

Anglo-Iranian Oil Company's new agreement with Iran is held up until mid-October after a filibuster in the Iranian parliament killed chances for approval of the pact just a day before parliament adjourned. The outcome of Anglo-Iranian's agreement is regarded as extremely significant in the Middle East as an index of the British oil industry's stability in the Arab world. A-I, which is owned 52 percent by the British government, is now uncertain whether it must re-negotiate its operating rights in the lush fields of the Persian Gulf, or whether the recently drafted and now suspended agreement will automatically be up for approval as soon as the Iranian parliament re-convenes.

A-I and Iran initialed an understanding in mid-July by which the company would increase its royalty payment to Iran from four to six shillings a ton on all petroleum production. This is an increase from 80 cents to $1.20 in U. S. currency equivalent. The royalty boost was negotiated as a supplement agreement to the 1933 convention between the company and Iran under terms of which the British concern holds exclusive exploration and exploitation rights in Iran. The new six-shilling rate was to have been made retroactive to January 1, 1948, and would have covered the 24,871,000 tons (179 million barrels) of oil produced in Iran last year.

One source estimated that A-I's payment to Iran for the year 1948 would be about $68 million compared with $28 million for the year 1947. Royalties for 1949 might reach $124 million.

In addition to the royalty increase, new terms called for payment to Iran of 20 percent of A-I tax-free reserves.

A presentation was made to the Iranian parliament to show that over the last 16 years Iran has obtained only 22.5 percent of A-I's profits, while asserting it should have received at least 50 percent.

Transit Agreement is Signed For Crude Line Through Syria

MIDDLE East Pipe Lines, Ltd., has signed a transit agreement with Syria for the company's 770-mile, 34-36-inch crude line from the Iranian oil fields at the head of the Persian Gulf to the Eastern Mediterranean. The agreement was reached immediately following Syrian approval of Trans-Arabian Pipe Line (TAPline) Company's line now building from the Saudi Arabian fields to Sidon, Lebanon.

While the route and terminal of the projected Middle East line have not been finally determined, due to the fact Iraq transit rights wait on the reconvention of the Iraq Parliament the last of this year, it is believed the line will come out either at Baniyas or Tartous. These are about the only two usable ports on the Syrian coast except Latakia, and are favorably located near a gap in the Lebanese mountains through which the line presumably would pass. Considerable harbor work would be required at either point for tanker loadings for Mediterranean movement to Europe. It has been hinted that Middle East may take the Tartous port and leave Baniyas for the proposed 30-inch Kirkuk-Mediterranean line of the Iraq Petroleum Company.

Middle East Pipe Lines was formed about three years ago but final structuring of the company and all transit negotiations were held up pending outcome of TAPline's deals with the various Arab states involved. It has been understood that Middle East would accept the same kind of agreement won by TAPline, an arrangement which would yield Syria about .6 cent (U. S.) for every ton of oil transported across her territory.

Middle East is owned 60.9 percent by the Anglo-Iranian Oil Company, which in turn is owned 52 percent by the British government; 24.7 percent by Standard Oil Company (N.J.), and 14.4 percent by Socony-Vacuum Oil Company.

Construction on the Middle East line, which will be the biggest diameter crude line in the world, will get under way late in 1950 with final delivery of TAPline's steel.

At the same time the Syrian government has granted Maritime Refineries, Ltd., an Anglo-Iranian subsidiary, a 70-year concession to construct and operate in Syria one or more refineries. The agreement envisages erection of a refinery at the Syrian coast terminal of the pipe line, and terms provide:

1. Crude processed for the Syrian government shall not exceed the volume necessary for products in local commercial distribution by the company.

2. Syria will prevent any export of its royalty oil to avoid competition with private company operations.

The cost to Syria of oil processed by the company shall be the difference between the open market value of the refined products and of crude of comparable quality of the charging stock, based on Gulf of Mexico price levels.

Royalty payments per ton of refined product are set as: three pounds sterling ($12) on each 1000 tons of product for the first 2 million tons refined; two pounds sterling ($8) on each 1000 tons between 2 million and 4 million tons; 1 1/10 pounds sterling ($4.40) on each 1000 tons between 4 million and 6 million tons; and one pound sterling ($4) on the same basis for all volume in excess of 6 million tons.

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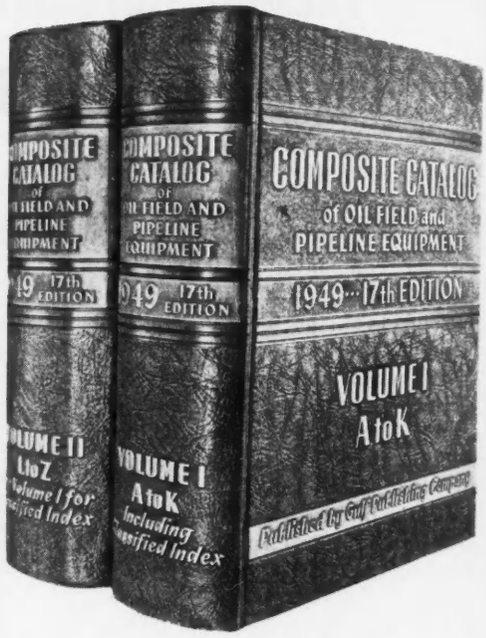

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NEW AND IMPROVED Equipment SUPPLEMENTING COMPOSITE CATALOG

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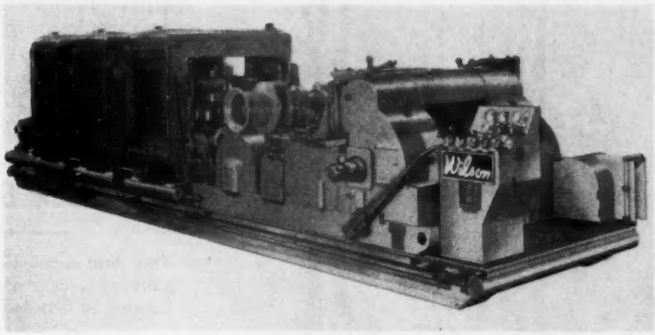
227—Medium Depth Rig

This item supplements Wilson Manufacturing Company data as shown on pages 4341-4376 of Composite Catalog.



A medium depth rig has torque converter drives on 1, 2, or 3 engines. The Giant Torcair rig is rated to depths of 7500 feet with 4½-inch drill pipe and 9000 feet if 3½-inch drill pipe is used. It measures 30 feet long, 6 feet, 11½ inches high, and 10 feet wide with the breakout and spinning catheads removed.

By using either the Twin Disc, Torcon or the GM Torque Converter, the Torcair offers a wide range of torque multiplication for varying drilling load conditions.

Wilson air-tube disc drum clutches are used on the rig. All air connections are on the outside.

Brakes are of the full circulating water-cooled type and are cam operated. A friction latch on the hand brake lever permits setting and locking this brake in any position without the use of a ratchet or chain.

Large capacity SKF self-aligning spherical roller bearings in forged steel housings are used. The drum bearings are secured to the main frame of the rig by large bolts going entirely through the frame post.

All chains are oil-bathed except final drive chains to drum, cathead, shaft and rotary table.

The frame is of heavy double channel steel. Drum frame has box section skids with box section channel steel posts and brake cross-member.

For additional information write Wilson Manufacturing Company, P. O. Box 329, Wichita Falls, Texas, *referring to* WORLD OIL *item* 227.

228—Diesel Engines

This item supplements Hercules Motors Corporation data as shown on page 1719 of Composite Catalog.

Series "DIX4" diesel engines are available in two bore sizes. The Model DIX4B is 3¼-inch bore x 4-inch stroke with a piston displacement of 133 cubic inches. The Model DIX4D is 3⅝-inch bore x 4-inch stroke and has a piston displacement of 166 cubic inches. The engines are the solid injection, compression ignition, four-stroke cycle type.

Equipped with pressure lubrication, the engine oil pump is mounted inside the oil pan. Main flow lube oil filter is attached to the cylinder block.

The combustion chamber is located at the side of the cylinder bore. During operation, as the piston proceeds to the end of its compression stroke, it passes across the passageway between the cylinder and the combustion chamber.

Velocity reaches its maximum just before the piston reaches the top of its compression stroke. At this time the air is moving at 50 times crankshaft speed, and into this swiftly revolving air the fuel is injected.

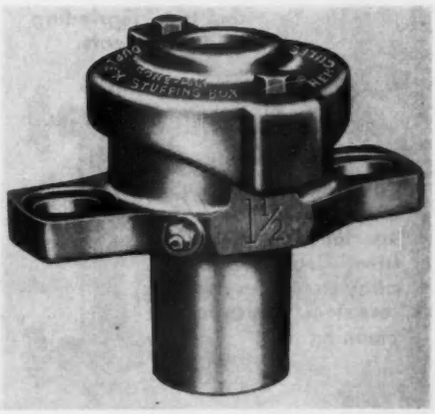
The fuel injection system consists of an American Bosch individual plunger pump and Bosch pintle type nozzles. Injection equipment operates at moderate injection pressures. The pintle type nozzle keeps the injector clean.

The engines have five main bearings. The crankshaft is counterbalanced and Tocco hardened high lead bronze steel-back bearings are used.

For additional information, write Hercules Motors Corporation, Market and East 11th Street, Canton 2, O., *referring to* WORLD OIL *item* 228.

229—Upper Gland

This item supplements Hercules Tool Company data as shown on pages 1716-1718 of Composite Catalog.



A self-lubricating upper gland to fit all Hercules polished rod stuffing boxes is designed with a minimum of parts. It is for use on pumping wells where there is excessive wear on the polished rod or liner, also for wells which pump fluid intermittently.

It eliminates shutting down the well frequently with the resultant loss of production and expense of repacking the stuffing box or replacing the polished rod or liner.

For additional information, write for Bulletin No. 124-SBLG, Hercules Tool Company, P. O. Box 286, Tulsa 1, *referring to* WORLD OIL *item* 229.

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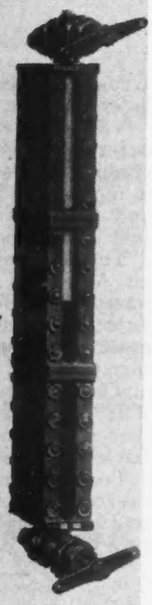
Liquid Level GAGES

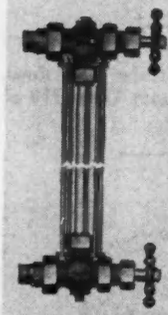
REFLEX

Reflex type complete with gage valves. Liquid shows black—empty space shows white. Liquid level is always unmistakable.



TRANSPARENT

Transparent type complete with gage valves. Used where through vision is desired under high pressures and/or temperatures.



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Tubular glass type, Chrome-Moly temperature resisting steel body, stainless steel trim, regrinding removable seats.

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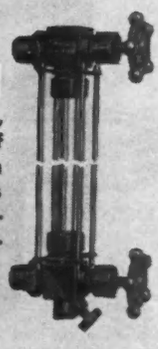
Tubular glass type, extra heavy body of special high strength alloy iron, shanks alloy steel, trim stainless steel, valves self-cleaning.



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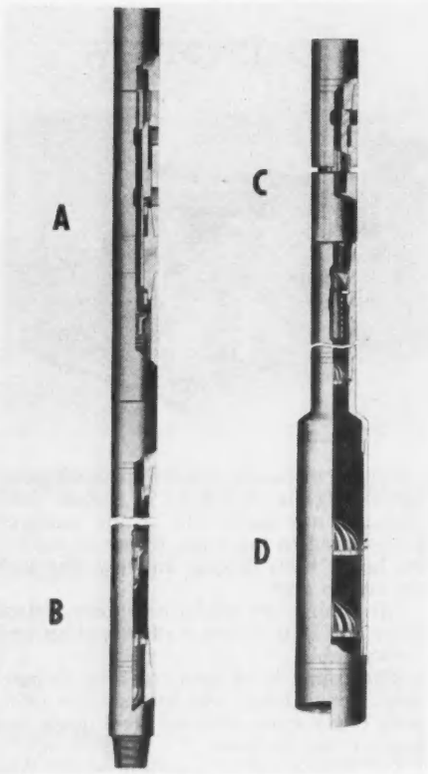
PENBERTHY INJECTOR CO.
Detroit 2, Mich.
Canadian Plant — Windsor, Ontario

230—Junk Snatcher

This item supplements Cavins Company data as shown on pages 996-1001 of Composite Catalog.



A hydrostatic multiple-action tool is run with drill pipe or tubing to clean out holes of removable junk—rock bit cutters, blades, millings, scale, broken slips, dies, broken cement retainers, nipples, collars, short lengths of pipe, swab and packer rubbers, etc.

The tool is run in the hole assembled in a string of drill pipe or tubing and by top-hole manipulation utilizes controlled and limited surges of the hydrostatic head in the well to pick up and retain bottom hole junk or fish.

The junk snatcher incorporates two separate assemblies. The upper assembly consists of the main valve (A) and flow control valve (B) which are positioned at a point previously determined by total well depth, density of fluid, and height of fluid head standing in the well. The function of the main valve is to seal off all pipe below it so that when the fishing string reaches bottom there will be a differential in pressure between the fluid below the main valve and the air above. The flow control valve (B) limits each surge to approximately one barrel; therefore, there is no danger of sloughing in an open hole. The lower assembly is made up of the by-pass valve (C) and upper and lower junk baskets (D), which are run at the bottom of the fishing string. The by-pass valve allows the fluid to drain out of the fishing string when coming out of the hole so as to prevent a "wet" job. The upper and lower junk baskets incorporate retainer assemblies which retain all junk "washed" into the baskets by each surge.

In addition to the hydrostatic surge action employed to "wash" junk into the tool, the Cavins Multi-Surge Junk Snatcher can be rotated and used with milling shoes and other attachments to remove bridges or break, shape, or center junk prior to each surge.

For additional information, write Cavins Company, 2853-2873 Cherry Avenue, Long Beach, Calif., *referring to* WORLD OIL *item* 230.

231—Rock Bit

This item supplements Globe Oil Tools Company data as shown on pages 1414-1417 of Composite Catalog.

The Globe cross section rock bit has greater bearing area and stronger construction which enable it to operate at any drilling speed or weight, or type of formation, according to the manufacturer.

Increased circulation is combined with wide spaced teeth to avoid the tendency to "ball up" in sticky formation. Large cutters permit the use of big bearings, give more side wall contact, and keep the hole out to gauge from the beginning of the run until the bit is pulled dull.

Available are two types, the S-46 for sticky formations, and the M-4C, shown, for harder digging.

For additional information, write Globe Oil Tools Company, Los Nietos, Calif., *referring to* WORLD OIL *item* 231.

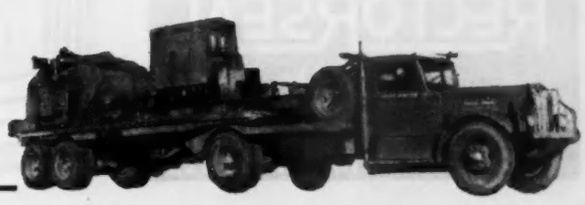
Meet competition with Autocars

Hoot Gibson, Oklahoma City, Oklahoma, is an oil field hauler for major oil companies in connection with drilling operations. He can do what others can't, because he owns this mighty Model DC-100-T Autocar-Diesel. It is shown loaded with a multispeed winch which is powered by a butane engine.

There's no time like the present to prove that the best equipment gives the best results. Competition-wise, the Autocar owner is sitting pretty. With his heavy-duty Autocars, he can deliver more, faster, and at lower cost.

AUTOCAR TRUCKS

They cost less, because they do more work



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✓SPEEDIER PENETRATION
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DIAMOND OIL WELL DRILLING COMPANY
204 Wemple-Avery Bldg. 110 West Wall
MIDLAND, TEXAS
Phone 2710

PROVED IN SERVICE

The Positive Leak Preventer

RECTORSEAL #1

Rectorseal #1 is a sure preventative for connection leaks on your rig—mud, steam, water or oil and gas lines.

It has been proved in service for 11 years in all types of extreme conditions of pressures and temperatures. It's a positive leak preventer.

It's easy to apply—economical—a little goes a long way. Available in convenient size cans at your supply store. Or write—

RECTORSEAL Dept. G
2215 Commerce St., Houston 2, Texas
Export: Champion & Smith, Inc., 617 S. Olive St., Los Angeles, Calif.
10 Rockefeller Plaza, New York, N. Y.

RECTORSEAL
Manufactured by
RECTOR WELL EQUIPMENT CO., INC.
Fort Worth, Texas
MAKING THE OIL INDUSTRY SAFER

NEW EQUIPMENT

SUPPLEMENTING COMPOSITE CATALOG

232—Filter Press Hydraulic Pressure Unit

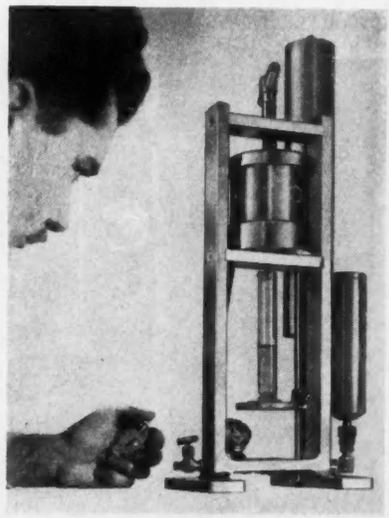
This item supplements Baroid Sales Division, National Lead Company, data as shown on pages 517-560 of Composite Catalog.

A dead weight hydraulic pressure unit for use in determining the filtration characteristics of drilling mud attaches to the standard Baroid No. 300 Filter Press and eliminates the need for outside pressure sources. The only requirement is a pint of fresh water.

The filter press provides the operator with a source of constant hydraulic pressure that is compact, simple in design, operation, and maintenance. It is especially recommended for drilling operations in remote or overseas areas where compressed nitrogen is difficult, or impossible, to obtain.

The dead weight assembly delivers 100 pounds per square inch pressure to the filter cell. The assembly is composed of a water reservoir, piston and cylinder, dead weight, delivery pressure gauge, two check valves, and a bleed-off valve.

By raising the dead weight attached to the piston, the operator draws water from the reservoir through a check valve into the cylinder. When the weight is released, the piston forces water through the outlet check valve, to the delivery pressure gauge, and to the unfilled part of the filter cell. When the system is closed, the dead weight causes the piston to exert a continuous 100 pounds per square inch pressure on the water in the piston chamber and against the mud in the filter cell. A bleed-off valve is provided to enable prompt release of the pressure on the cell at the completion of the test. The hydraulic system has sufficient volume to run the usual 30-minute filtration test without further attention from the operator.



For additional information, write Baroid Sales Division, 830 Ducommun Street, Los Angeles 12, *referring to* WORLD OIL *item* 232.

EACH WAY-EVERY DAY
—DAILY Flights to—
VENEZUELA
and
JAMAICA!

Chicago & Southern Air Lines' fleet of 4-motored Douglas Skymasters now offers seven-days-a-week service through the Houston and New Orleans gateways to Caracas and Kingston. Flights each way every day provide one-plane service from the Great Lakes to the Venezuelan oil capital. Ask your travel agent or nearest C&S ticket office.

CHICAGO & SOUTHERN AIR LINES
General Offices, Memphis, Tenn., U.S.A.

C★S

Monarch smooth bore Oil Suction and Discharge Hose acts as superhighway transport system

Speed is the byword! And because of the special features of this hose, speed becomes an accomplished fact.

The smooth, oil- and gas-resistant synthetic rubber inner tube—pioneered and developed by Hewitt engineers—permits you to load or unload oil or gasoline in jig-time. What's more, this fluidway has been specially compounded so that it will not swell nor flake, when in contact with petroleum products.

Of course, this is only one of many advanced features built into Monarch Oil Suction and Discharge Hose to assure you long, efficient, low-cost service. You get many construction "extras"—the kind of extras that enable you to load and unload tankers with far greater efficiency than is possible with ordinary, rough bore hose.

For complete information, phone your Hewitt distributor listed in the classified pages of your local phone book. Or write Hewitt Rubber Division, 240 Kensington Avenue, Buffalo 5, New York.

HEWITT

Oil Suction and Discharge Hose

Hewitt offers the oil industry a complete line of special hoses

For oil drilling:

Rotary Drilling Hose
Flexible Vibration Hose
Mud Pump Suction Hose

For oil refining:

Oil Suction and Discharge Hose
Sea Loading Hose
Barge Loading Hose
Fire Hose
Flue Cleaning Hose
Steam Hose

For oil distributing:

Tank Car Hose
Tank Truck Hose
Fuel Oil and Distillate Hose
Gasoline Pump Hose

also Propane-Butane Hose for all types of service

HEWITT RUBBER DIVISION **HEWITT-ROBINS INCORPORATED**

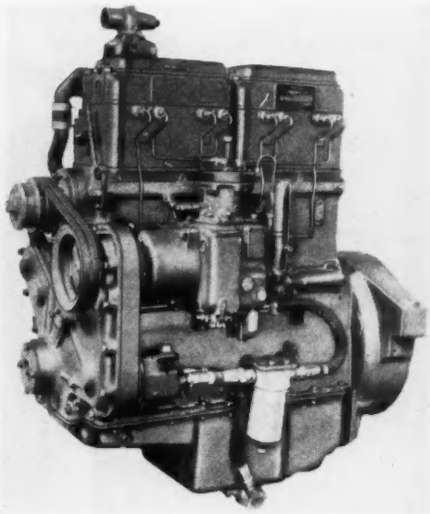
134—Four-Cylinder Diesel

This item supplements Cummins Engine Company, Inc., data as shown on pages 1089-1108 of Composite Catalog.

A four-cylinder diesel engine has a maximum rate horsepower of 110 at 1800 revolutions per minute. Mounting dimensions for the basic industrial model HR-400 are 43-7/32 x 29-3/8 x 47-3/8 inches.

The engine has a 5⅛-inch bore and a six-inch stroke, with a piston displacement of 495 cubic inches. The four-cycle engine is equipped with standard two-valve heads, continuous groove main bearings, standard liners and head gaskets.

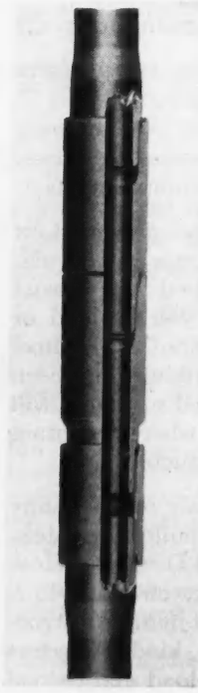
Available are the automotive model, HRB-400, five industrial models with special equipment making them applicable to various types of industrial applications, and a marine model.



For additional information, write Cummins Engine Company, Inc., Diesel Drive, Columbus, Ind., *referring to* WORLD OIL *item* 134.

135—Tubing Tool Joints

This item supplements American Iron & Machine Works Company data as shown on pages 221-260 of Composite Catalog.

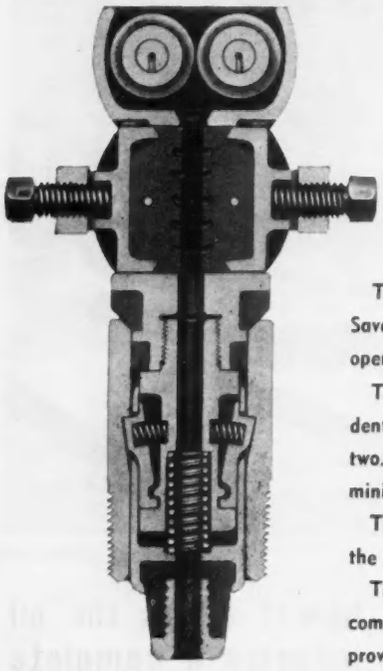


New tubing tool joints are designed for use on tubing when it is used for completion, workover, and deepening. The outside diameter and inside diameter of this new tubing tool joint is the same as the outside diameter of the tubing coupling and the inside diameter of the tubing.

The use of these tubing tool joints eliminates wear and abuse on the tubing and tubing coupling threads due to making and breaking of stands at the point where the tubing tool joints are installed on the string. When the tubing is run to produce the well, the tubing tool joints are removed. All thread wear is on the tubing joint connections.

For additional information, write American Iron & Machine Works Company, Box 1177, Oklahoma City, *referring to* WORLD OIL *item* 135.

For Swabbing Operations



Be Sure IT'S A KING *Be Safe*

TYPE 3AR AUTOMATIC RELEASE WIRE LINE STRIPPER

Type 3AR King Wire Line Stripper (often called "Oil Saver") is the ideal tool to use in connection with swabbing operations.

The positive latch and sure release insure against accidents and eliminate the possibility of jerking a wire line in two. The non-sparking materials used in its construction, minimize the fire hazard.

The packing is inserted from the sides of the tool and the tool can be repacked while the line is in the hole.

The roller line guides center the line and outlast the more commonly used bushing many times. Grease nipples are provided to lubricate the guide rollers. Convenient hand holds contribute to easy handling of the tool. *This tool is constantly coming into greater use.* A trial is convincing.

FOR WIRE LINE CORING
the 4AR KING WIRE LINE STRIPPER is widely used

The Type 4AR Stripper is similar to the Type 3AR, except it is a little larger. It is commonly used in connection with the Type 4C King Circulating Head. It can be, and sometimes is used with other makes of circulating heads.

All prices F.O.B. Houston, Texas, and subject to change without notice.

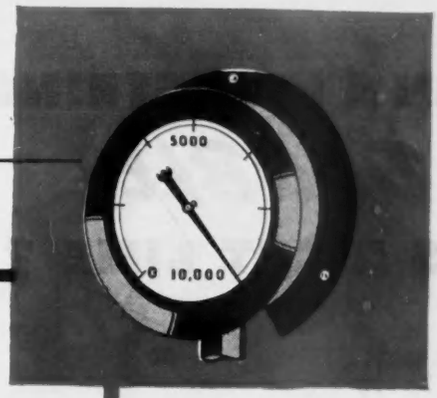
Sold through your supply store

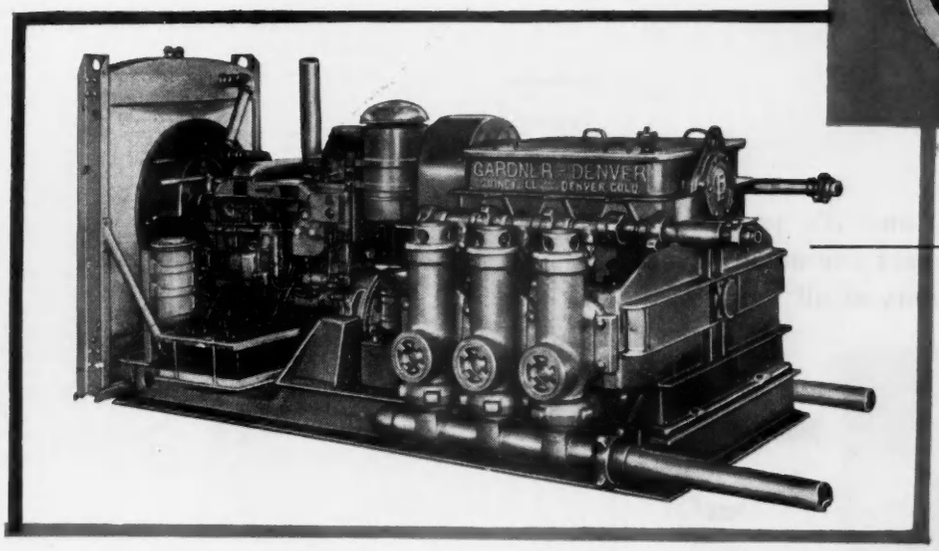
***Export:* R. S. STOKVIS & SONS, Inc.**
17 Battery Place, New York 4, N. Y.

See 1948 Composite Catalog (Pages 2129 to 2140) for detailed description of other King Tools.

KING OIL TOOLS
210 TERMINAL STREET PHONE WO 8013
HOUSTON 20, TEXAS

strength for this





and stamina to finish the job

Gardner-Denver PL7 Super-Pressure Oil Well Service Pump

Built for squeeze pressures up to 10,000 pounds per square inch, the Gardner-Denver PL7 Super Pressure Oil Well Servicing Pump is designed with extra safety factors to see the job through to completion. The PL7 pumps more than 200 gallons per minute at 1,000 pounds per square inch pressure — or approximately 25 gallons per minute at 8,000 pounds pressure.

New Compactness — As a result of new principles of design, the PL7 pump is unusually compact and mobile. The six pump cylinders are arranged in two banks, as two triplex single-acting plunger pumps. One bank of three plungers is 3½ inches in diameter and the other bank is 4¾ inches in diameter, all using 7-inch stroke.

Unusual Flexibility — An exclusive feature of the PL7 pump provides a wide pressure and volume range. Pump may be operated on either bank, or on both banks at the same time. Low pressure work is handled at a volume of more than 250 gallons per minute, using all six plungers. High pressure work is done with either bank of three cylinders, and at reduced speed pump operates at 8,000 lbs. pressure, or up to 10,000 lbs. squeeze pressure.

Strong, Yet Lightweight — Extensive use of steel in constructing the PL7 assures ample strength for extreme operating conditions—keeps pump lightweight and easy to haul.

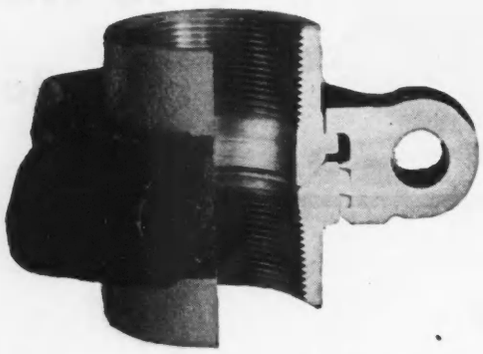
For complete information, write
Gardner-Denver Company, Quincy, Illinois
In Canada: Gardner-Denver Company (Canada) Ltd., Toronto, Ontario

Dallas • Houston • Tulsa • St. Louis • Los Angeles • San Francisco
New York • Chicago • Pittsburgh • Denver • New Orleans
Continental Supply Co., Continental Bldg., Dallas, Texas
Export Division: 30 Rockefeller Plaza, New York, N. Y.
Republic Supply Co. (of Calif.) 2600 S. Eastland Ave., Los Angeles, Calif

GARDNER-DENVER SINCE 1859

CAN A KITE STRING DOUBLE AS A CAT LINE ?

No! . . . and it's just as far-fetched to expect one union to meet the requirements of all jobs.



WECO Unions are "Job-Masters."* Each member of this "most complete line of wing unions in the world" is built to give you more safety, longer service, greater utility for it's particular job than any so-called "all-purpose" union.

An outstanding example of WECO "Job-Master"* design and construction is the familiar Yellow and Black, Figure 100 "Bar Nut" Union. Designed for test pressures up to 1000 pounds, it is the perfect union for low pressure lines, manifolds, separator and tank connections, etc. It is unexcelled for easy handling, quick sealing and positive leak-proof security. Figure 100 is made of certified malleable iron in sizes from 2" through 8". Holes in the wing nut . . . an exclusive WECO feature . . . permit tighter sealing with a simple bar in addition to faster make-up with a hammer.

Standardize on WECO "Job-Master"* Unions . . . you can always be sure the union is right for the job.

**Not a jack of all jobs . . . but master of one.*

IMMEDIATE DELIVERY FROM YOUR SUPPLY STORE

WECO

WELL EQUIPMENT MFG. CORP.

Subsidiary of Chiksan Company
HOUSTON 1, TEXAS
Exclusive Sales Representative Outside Mid-Continent Area
CHIKSAN COMPANY
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Export Sales: CHIKSAN EXPORT COMPANY, Brea Calif. New York 7

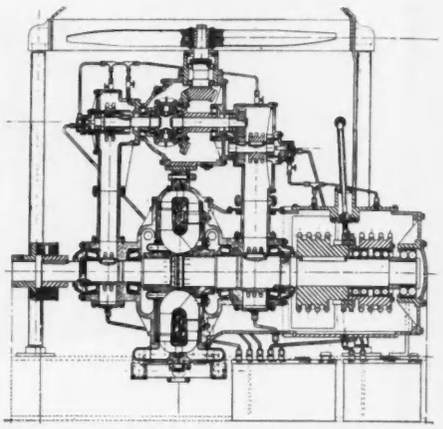
Manufacturers and Distributors of Oilfield, Refining, Marine and Industrial Equipment

NEW EQUIPMENT

SUPPLEMENTING COMPOSITE CATALOG

136—Torque Converter

This item supplements Axelson Manufacturing Company data as shown on pages 301-336 of Composite Catalog.



Designed for use with oil well drilling rigs, the first model of a new hydrokinetic torque converter drive, known as the T-30, is rated at a maximum of 600 horsepower at 900 revolutions per minute, and a minimum of 350 horsepower at 800 rpm. Exclusive manufacturing and sales license for the C. M. O'Leary patents on the equipment have been acquired by Axelson Manufacturing Company.

Future plans call for the Axelson-O'Leary torque converter to be built in four sizes for the petroleum drilling industry. Two high-speed types rated at 130 to 300 horsepower at 1600 rpm, and 250 to 575 horsepower at 1600 rpm; two low-speed types rated at 175 to 450 horsepower at 900 rpm, and the T-30.

Air foil blading, the method of mounting the turbine and reaction blades, combined with the forward-and-reverse-flow fluid circulating system and an automatic cooling system, permits the torque converter to be used as a brake.

The automatic cooling system permits the torque converter to be operated at the stall of the output shaft for an indefinite period without raising the fluid temperature in the converter above its normal operating range.

In drilling operations the torque converter can be used as an automatic weight control and will feed the drill bit only as fast as the bit is capable of making hole, the weight on the drill bit being controlled from the engine throttle setting.

When using the torque converter as a brake, the rate of descent may be controlled to any speed desired and the drill pipe may be brought to a complete stop by engine throttle control without the use of a manually operated brake.

A torque and efficiency indicator is placed within view of the operator to indicate when a shift to the next speed

No Guessing WHEN YOU USE THE SIGNAL CLOSING SET SHOE

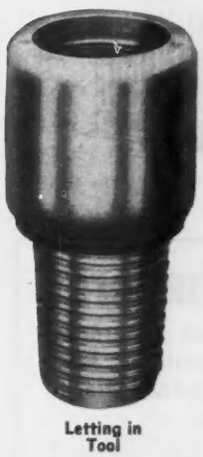
With the Layne "Tubing Set" Packer, the signal closing set shoe, screen liner and packer are run in the casing with the tubing connected in the set shoe and not the Packer.

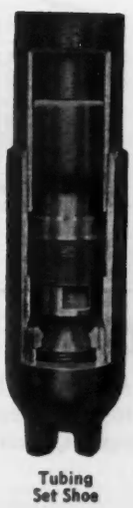
If the pump is run slowly while the valve is being closed, circulation will stop entirely when the valve is completely closed. When the "letting in" tool is released from the valve, circulation will start again.

You can make one trip into the hole do the job of two by using the Layne Tubing Set Packer.

Packer

Collapsing Tool


Letting in Tool


Tubing Set Shoe

THE LAYNE "TUBING-SET" Packer

Write for Complete Information

THE LAYNE AND BOWLER COMPANY

EXPORT:
Jeff Tucker
Room 1636
30 Rockefeller Plaza
New York, N. Y.

General Office & Factory
8000 MARKET STREET HOUSTON, TEXAS

WEST COAST:
Layne & Bowler Corp.
900 Santa Fe Ave.,
Los Angeles, Cal.

is needed to obtain maximum horsepower delivery to the load.

In addition to this new line of torque converters, Axelson also has in the design stage a new automatic four-speed forward, two-speed reverse transmission for use on drilling rigs. This unit may also be set for manual control.

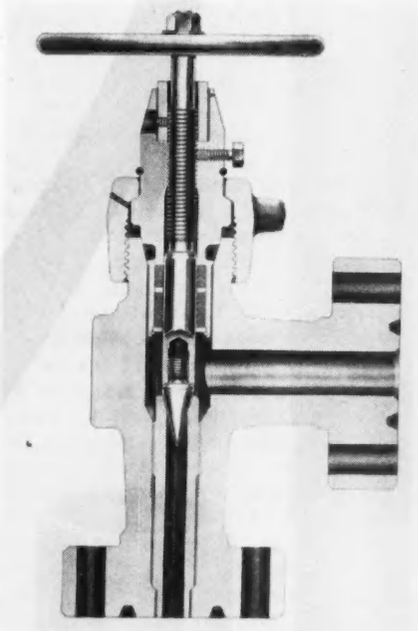
In the automatic range, the transmission will shift progressively up or down as the torque load on the torque converter increases or decreases throughout four speed ranges. This transmission is of the planetary differential type, with provision being made for power take-offs from both reaction members of the differential for torque control on drill pipe if automatic drilling is desired.

This transmission is also designed to compound two power pumps. In operation one pump is driven by the output member, and the other pump is driven by the reaction member of the differential. The two pumps being compounded need not be of the same size or stroke length. One, two or three engines may drive into the differential transmission, and the power will be distributed to the pumps as required automatically by differential action. The transmission provides two speeds in compound and four speeds for parallel or individual pump drives.

For additional information, write Axelson Manufacturing Company, 6160 South Boyle Avenue, P. O. Box 98, Vernon Station, Los Angeles 11, *referring to* WORLD OIL *item* 136.

137—Choke

This item supplements Oil Center Tool Company data as shown on pages 3033-3084 of Composite Catalog.



Models PC positive and JW adjustable chokes have hand-tight flow cap and "O"-ring bonnet seal unit, with enclosed stem thread and scale indicator. The flow cap and sealing unit reduces bean replacement time to a minimum, since the bean can be removed by making two turns of the hand-tightened cap. The cap will hold under full rated pressure.

The body of the PC is designed to accommodate O-C-T's JW adjustable choke bonnet and seating bean, as shown. Enclosure of the stem thread and scale indicator protects these elements from external corrosion.

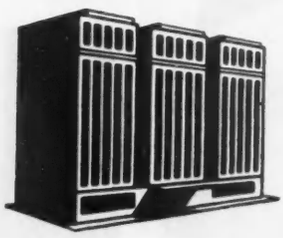
Conversion of the choke permits the use of a JW for cleaning a well, with a change to a PC for steady production. Parts are interchangeable with other O-C-T choke parts. Any standard O-C-T flow beans, cage beans or choke inserts may be used in the body.

For additional information, write Oil Center Tool Company, 1912 Airline Drive, Houston, *referring to* WORLD OIL *item* 137.

SKIRVIN HOTELS

Welcome to the Skirvin Oklahoma City

One Of The Nation's Traditionally Fine Hotels.



Skeet Shooters, Hunters!

Here's a beautiful lifetime cabinet for storing your guns and equipment (see photo at left). Made by real craftsmen, hand-rubbed finish.

Dimensions: 74" high, 46" wide, 15" deep. Gun cabinet 48¼" inside height. Cabinet base has 3 drawers, 2 lockers. Gun case and 1 locker equipped with cabinet locks. All hardware black forged iron, all glass ⅛" plate. Built in two pieces for ease of shipment. Specify whether desired for 8 or 12 guns.

NORTHERN BLACK WALNUT, $200 fob factory
WESTERN KNOTTY PINE, $175 fob factory

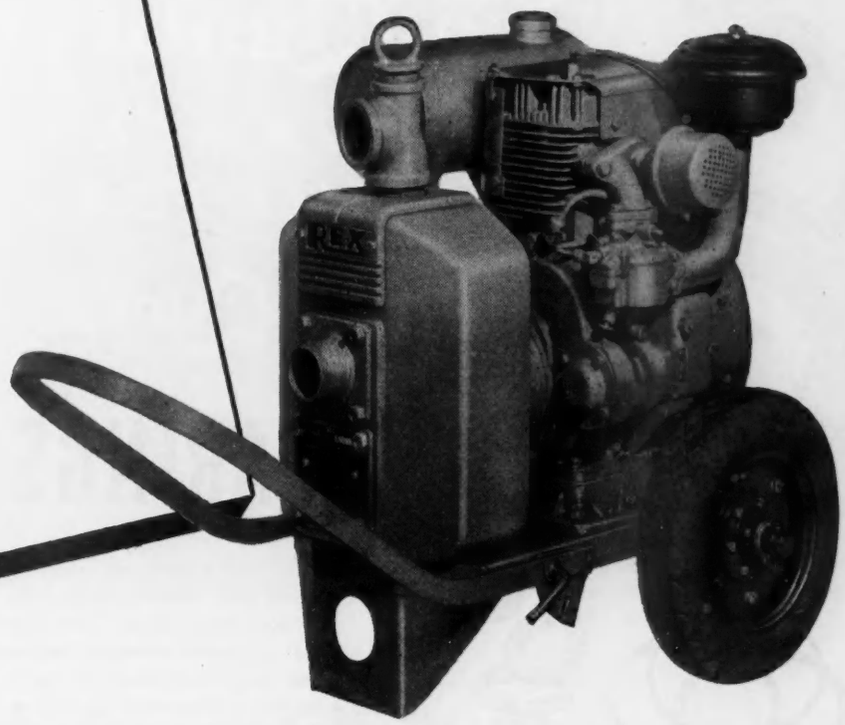
(We pay shipping charges west of Mississippi and east of Rockies south of Kansas City.)

MODERN MODE FURNITURE MFG. CORP.
Dept. B—124 W. Jones—San Antonio, Tex.

THERE'S A NEW LITTLE YELLOW PUMP . .

The "Easy-Flow" Rex!

- IT'S NEW
- IT'S DIFFERENT
- IT'S DURABLE
- IT'S EFFICIENT
- IT'S LIGHT
- IT'S FAST
- IT'S HANDY



Light weight . . . outstanding durability . . . top efficiency, the new Rex "Easy-Flow" Pump gives you all three and then some. It's the ideal pump for oil field utility service.

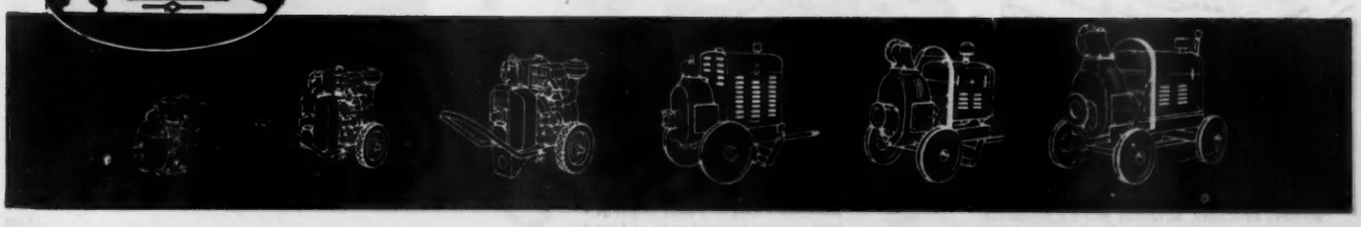
The pump body is press-formed of Armco Ingot Iron, famous for resisting rust and corrosion. This new body won't crack or shatter under heavy blows . . . or in freezing weather.

The Rex "Easy-Flow" Pump is the fastest priming, most efficient pump in the field today. The press-formed body and volute have smoother surfaces, assuring faster flow of water through the pump. There is no re-circulating shut-off valve, eliminating wasteful re-circulation. If damaged, body can be repaired by welding.

Combine all these advantages, plus the famous Rex adjustable Z-Metal Peeler and Z-Metal Impeller, and it's easy to see why you'll get a new high in long service life.

For all the facts, see your Rex Field Engineer, your local Supply Store, or write Chain Belt Company, 1639 West Bruce St., Milwaukee 4, Wis.

REX **OIL FIELD PUMPS**

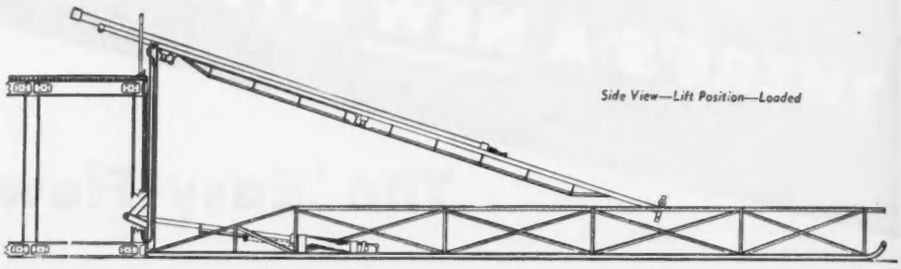


CHAIN BELT COMPANY of MILWAUKEE

OTHER NEW AND IMPROVED *Equipment*

138—Automatic Pipe Handler

A new solution to the problem of handling drill collars, drill pipe, casing, tubing, etc., from the pipe racks to the derrick floor where it can be picked up is offered by the King Automatic Pipe Handler. The device is either hydraulically, pneumatically or electrically operated and consists basically of a pipe trough, track, skids, lever arms, powering mechanism and control valves. It is placed perpendicular to the vee side of the derrick floor, and will automatically lift pipe, collars, etc., from the pipe rack up to the floor as shown in the drawing.



Side View—Lift Position—Loaded

Pipe is racked in the conventional manner. As a joint is needed on the floor, the loader control valve is opened and a joint rolls into the trough of the handler. The power mechanism raises the trough at an angle so the pipe is in a convenient position for handling on the derrick floor. When the pipe has been removed, the trough is returned to a reclining position ready to receive the next joint and repeat the operation.

When it is necessary to lay down joints of pipe, collars, etc., the handler is raised and a joint of pipe slides into the trough. The joint is lowered to pipe rack level where a foot valve controlling the unloader is opened and the joint is ejected from the handler onto the rack.

For additional information, write King Tool Company, Inc., Longview, Texas, *referring to* WORLD OIL *item* 138.

Top Quality
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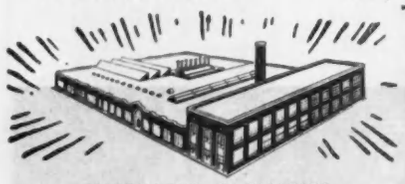
CALLS FOR
Top Quality

BEARINGS

Down time is costly Drilling and other hard working oil country equipment require bearings that can resist extremely severe stress, loads and shock in round-the-clock service without wear or failure. The conception and building of special bearings for such rugged service is a basic part of our business—has been for over a third of a century. Made from high carbon or alloy steel specially heat-treated and meticulously ground, Aetna custom bearings possess plus quality that unfailingly shows up in lowest final costs.

Our service on "specials" starts with a mere idea—your mere mention of an application problem—continues through every phase of designing, engineering, laboratory testing and production to efficient operation on the job. Call on us by wire, 'phone or letter.

AETNA BALL AND ROLLER BEARING COMPANY
4600 Schubert Avenue • Telephone CAnal 7-2410 • Chicago 39, Illinois



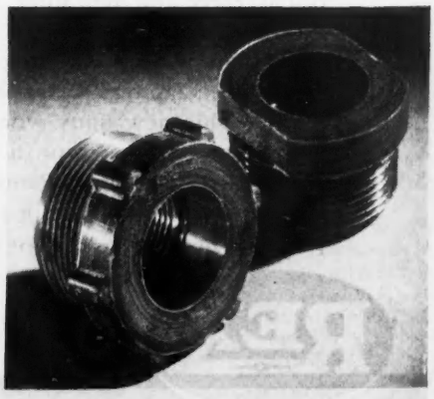
INCREASED FACILITIES
A new plant addition, new processes and machinery, new and completely modernized engineering laboratory facilities—from these new Aetna resources will come the best bearings we have ever built, advanced anti-frictioneering service to better the oil country equipment you buy or build tomorrow.

Standard and Special Ball Thrust Bearings • Angular Contact Ball Bearings • Special Roller Bearings • Ball Retainers • Hardened and Ground Washers • Sleeves • Bushings

139—Electrolysis Bushings

Ridges are spaced equally around the perimeter of a new electrolysis bushing, instead of the flat wrench lands previously used. The ridges permit a wrench to be applied from any angle.

Mechanical thread strength of the



bushings is equal to that of pipe threads. Constant dielectric strength and dimensional stability are claimed.

For additional information, write R. W. Lytle, vice president in charge of special engineering, The Formica Company, 4700 Spring Grove Avenue, Cincinnati 32, *referring to* WORLD OIL *item* 139.

Craftsmanship
plus
Precision
Equipment

Checking precision threads on Pittsburgh Special Drill Pipe at Pittsburgh Steel Company

Pittsburgh Special Drill Pipe

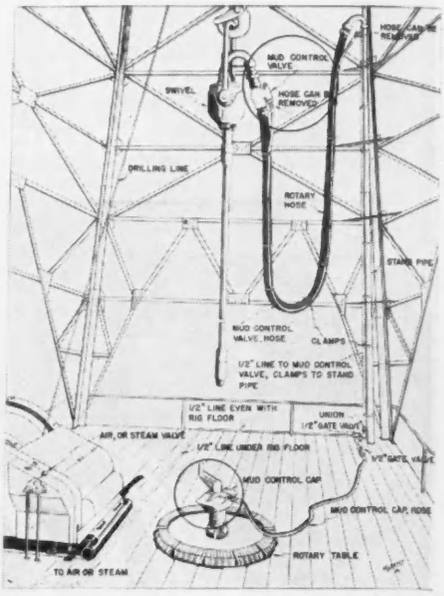
You save time and money with Pittsburgh Special Drill Pipe because it's precision made to do a good drilling job under all conditions. Skilled men—modern equipment, practical design and sound steel-making practice are combined at Pittsburgh Steel to give you the best in drill pipe service. For technical data and information on how to order see your Pittsburgh field engineer or write Pittsburgh Steel Company, Dept. WO, Grant Bldg., Pittsburgh 30, Pa.

P

Pittsburgh Steel Company

140—Mud Control Unit

A quick and positive process for chasing drilling fluid from the kelly and drill pipe during trips has been developed through the use of the MUDCO drill pipe mud control valve and assembly. Using compressed air and/or steam the permanently installed equipment overcomes the nuisance of wet connections or wet trips and in addition the control valve provides an added safety control by preventing back flow in the drill pipe of the drilling mud under blowout conditions. After the well has been shut in by means of the blowout preventers and the check valve provided in this unit, it is still possible to pump through the unit providing the pressures are not greater than the pump pressures available so that the hole can be circulated by bleeding off at the blowout preventers, thus controlling the well under shut in conditions. In addition, should weighted fluid be required, the weighting material can be added and introduced through the drill pipe mud control valve and the hole bled off until sufficient weight has been



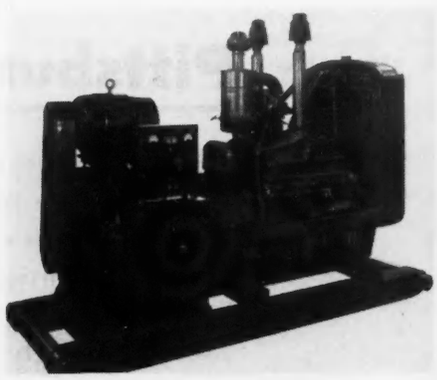
built up in the drilling mud to overcome the formational pressures.

For additional information, write Mud Products, Inc., Philtower Building, Tulsa, *referring to* WORLD OIL *item* 140.

141—Electric Plant

A new packaged electric plant has an H-540 Le Roi engine, directly connected to a packaged generator.

The engine is an eight-cylinder, four-cycle type, and operates on gas, butane or gasoline. Continuous duty rating is 30 to 50 kilowatts, with intermittent



duty rating up to 75 kilowatts. A piston travel of 900 feet per minute is maintained at 1200 revolutions per minute, and at 1275 feet per minute at 1800 rpm, this low rating being accomplished by the 4½-inch stroke as compared to the conventional 5½- to 6½-inch stroke.

The plant is supplied on a portable skid type steel base or can be furnished for permanent installation.

For additional information, write Carson Machine & Supply Company, 202 Southeast 29th Street, Oklahoma City, *referring to* WORLD OIL *item* 141.

DAN L. CLARK W. M. AVERILL RUPERT COX

DAN L. CLARK DRILLING COMPANY

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POWER AND STEAM RIGS

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INCREASE DURABILITY... MINIMIZE REPLACEMENTS

of Cast Parts in Oil Field Equipment

by using NICKEL ALLOY STEEL CASTINGS

THIS "CHRISTMAS TREE" CARRIES PEAK LOADS

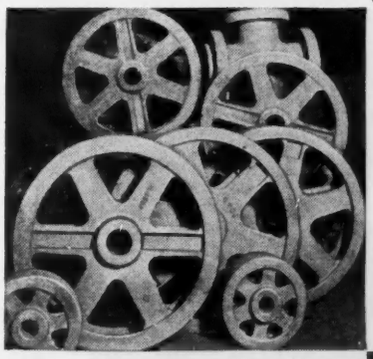
Here are flanged crosses, tees and fittings of cast nickel - chromium - molybdenum steel, produced by Los Angeles Steel Casting Co., Los Angeles, for Regan Forge & Engineering Co., San Pedro, Calif. After normalizing and drawing at 1200° F., these castings show:

Tensile Strength, p.s.i.	100/110,000
Yield Point, p.s.i.	75/85,000
Elongation in 2", %	18/22
Reduction of Area, %	35/45
Brinell Hardness	200/235

ADVANTAGES

of Alloyed Over Plain Carbon Steel Castings

1. STRONGER... HIGHER YIELD STRENGTH
2. LESS BULK and DEADWEIGHT
3. HARDER... MORE WEAR-RESISTANT
4. BETTER RESPONSE TO HEAT TREATMENT
5. GREATER SHOCK-RESISTANCE
6. GREATER FATIGUE STRENGTH
7. LESS EMBRITTLEMENT AT SUB-ZERO TEMPERATURES



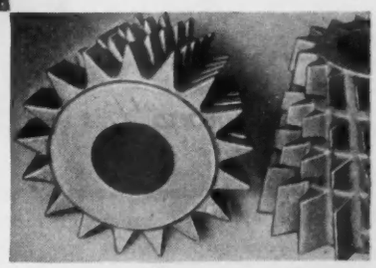
BUILT FOR LONG, DEPENDABLE PERFORMANCE

These gear blanks for pump units were cast in nickel-chromium-molybdenum steel by Texas Electric Steel Casting Co., Houston, Texas, for Lufkin Foundry & Machine Co., Lufkin, Texas. The castings were quenched and drawn to provide:

Tensile Strength, p.s.i.	105,000 min.
Yield Point, p.s.i.	75,000
Elongation in 2", %	22
Reduction of Area, %	55
Brinell Hardness	260-290

CAST NICKEL ALLOY STEEL STANDS THE GAFF

These case-hardened rock bit cutters were cast in a steel equivalent to 4615 type (nickel-molybdenum steel) by Westelectric Castings, Inc., Los Angeles, Calif. They exemplify use of nickel alloy steel castings for service which demands materials far above average in strength, hardness, toughness and dependability.



Nickel alloy steel castings have excellent wearing qualities and withstand combinations of severe static and dynamic stresses. Applications include:

Brake drums	Core tube pullers
Pump bodies	Slush pump valves
Crown block sheaves	Bit bodies and cutters
Traveling block sheaves	Slush pump liners
Drilling valves and fittings	Draw works gears and sprockets

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Please send me your 32-page booklet entitled "NICKEL ALLOY STEEL CASTINGS IN INDUSTRY"

Name.....*Title*.....

Company.....

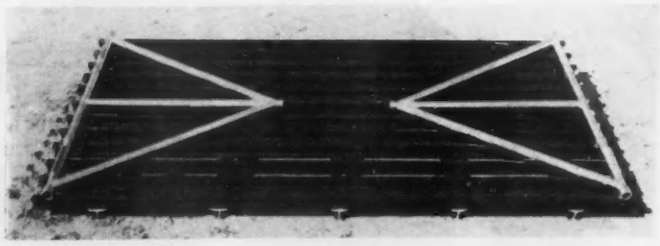
W. O. 9-49

Address.....

City.....*State*.....

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N. Y.

142—Prefabricated Cattle Guard



A prefabricated, sturdy cattle guard has been manufactured to fold down into one flat, easily-portable section that can be completely recovered for re-use. It is eight feet wide and 12 feet long, and is made from 40- to 60-pound per foot railroad railing. End posts are all-welded 2½-inch pipe, painted aluminum. Cross beams are of 80-pound per foot railing. The cattle guard is completely primed and painted, the railing being painted black. The end posts are self-supporting in the upright position, and fold down for ease in transporting or storage.

Immediate delivery can be made on standard sizes of 8 feet by 15 feet; 8 feet by 20 feet; and 10 feet by 20 feet. These units are fabricated in a new and fully equipped modern plant.

For additional information write Housh Drilling Company, Gulf Building, Houston, *referring to* WORLD OIL *item* 142.

143—Self Priming Pumps

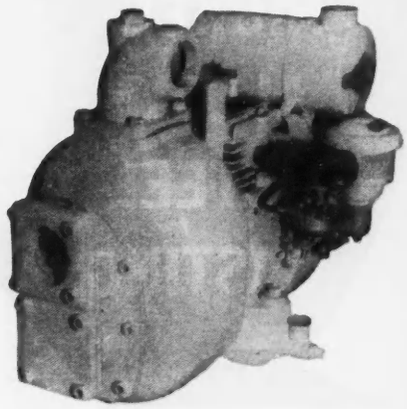
Designed for general utility use, a new line of self priming pumps will pump dirty water, oil, gasoline, and will handle solids up to one-half inch in diameter.

Powered by one to two horsepower Briggs and Stratton engines, the two-inch pump has a capacity of 5000 gallons per hour and the 1½-inch, 3000. Complete with engine, the pumps weigh as little as 54 pounds.

The Twin Priming system eliminates priming valves. Dual volutes make possible the "hydro-scour" casing, with one volute discharging toward the bottom of the case continually scouring and flushing it. The other volute discharges toward the top for separation of entrained air.

The pumps have self-adjusting double shaft seal, built-in suction check valve, trash type impeller, permanently aligned construction, carrying handle, flanged connections, cleanout plate and discharge elbow.

For additional information write Ohler Machinery Company, P. O. Box 687, Waterloo 3, Ia., *referring to* WORLD OIL *item* 143.



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Single X and Double X Lathe Cut SEAMLESS NIPPLES

Longhorn Machine Works regularly maintains large stocks of these precision manufactured nipples so that your supply store can fill your order promptly. Plastic coating protects threads from rust and handling damage insuring perfect connections.

Sizes ¼" to 6⅝" in standard lengths. Special sizes, stainless and monel furnished to requirements.

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Announcement

VOLUMETRIC AND PHASE BEHAVIOR OF HYDROCARBONS

by

BRUCE H. SAGE and WILLIAM N. LACEY

Ready for distribution Sept. 6th

This standard reference work, reporting investigations of the authors closely related with Research Project 37 of the American Petroleum Institute, first published in 1939 and out-of-print for some two years, is again available.

The author's announced purpose for the volume, "to set out for consideration the fundamental principles and some of the facts relating to that type of hydrocarbon behavior which does not involve chemical reactions or changes in the molecular species present," indicates rather accurately the principal contents.

Chapter headings of the book include: Introduction; Mathematical Concepts; Behavior of Pure Substances; Two-Component Systems; Three Component Systems; Multi-Component Systems; The Phase Rule; Partial Quantities; and Ideal Solutions.

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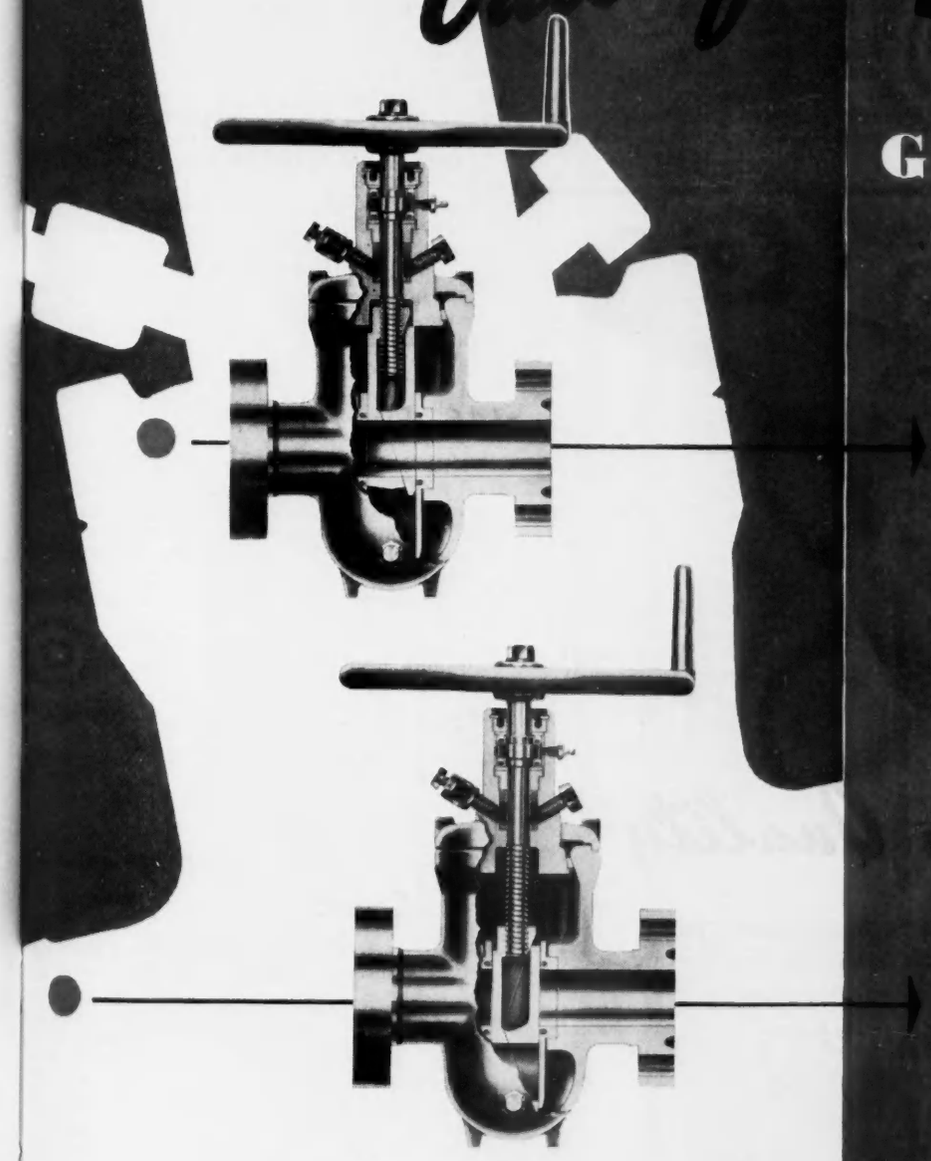

W. K. M. GATE VALVES

In the long run W.K.M. Valves have proved their case for superiority in the oil industry. Over 80% of all the World's high pressure wells are equipped with W.K.M. Valves.

OPEN

Smooth, full-bore opening entirely through the valve. No cavities or corners to collect sediment or cause turbulence. Seats not exposed to cutting or abrasion.

Free Floating operation against full-rated pressure is obtained by the W.K.M. Parallel Expanding Gate. A slight movement of the wheel collapses the gate away from the seats, eliminating wedging and freezing. Double roller thrust bearings on the stem make operation even smoother.

The Expanding Gate gives a perfect seal against both seats when valve is open as well as closed.

CLOSED

Pressure Seal Bonnet requires no flanges, studs or nuts. Greater pressure gives tighter seal. Self-adjusting to temperature changes.

W.K.M. Valves hold tight against pressure in both directions. The Gate expands against both seats with a slight turn of the handwheel and seals perfectly.

W.K.M. SUPERIOR DESIGN INCLUDES THESE ADDITIONAL FEATURES

- **Combination wipe and seal rings keep the gate clean . . . pressure out . . . grease in.**
- **Combination plastic-chevron packing—uses no gland or gland follower.**
- **Lubricant contained in entire body . . . no special lubricant required . . . seal does not depend on lubricant.**
- **Oversize bronze renewable seats.**

W-K-M Company, Inc.

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Cable Address: "WILKOMAC"

Export Office: 30 Rockefeller Plaza, New York, N. Y.

144—Hard Facing Alloys

Practical instructions on the application of Stoody hard facing alloys to oil field equipment are contained in a 20-page bulletin. Methods of applying hard facing material to such equipment as bearing surfaces, drilling bits, clutch jaws, pump sleeves, valve seats, wash pipes and tool joints, are described in detail.

Each of the 25 different tools or applications discussed is illustrated with instructive cut-away views and drawings, showing in step-by-step manner how the metal surface is prepared, how the hard facing material is applied, and how the work is finished. Accompanying each job description is a recommendation as to the type of alloy that should be used, and whether it should be applied by acetylene or electric welding.

To facilitate cost estimating on a particular job, there is included with each description a summary of the coverage per pound of rod that can be expected for a given thickness of surfacing, and the price per pound of the particular rod. Tables in the back of the bulletin give, for each type of surfacing, the specifications, hardness, wearing qualities and physical dimensions of the various Stoody hard facing rods and insert materials.

For a copy of this bulletin, write Stoody Company, 1165 West Slauson Avenue, Whittier, Calif., *referring to* WORLD OIL *item* 144.

145—Tank Calculator

A slide rule type calculator shows storage capacity in gallons and cubic feet in tanks of from 10 to 100 feet high and from 20 to 120 feet in diameter. Included on the calculator are the weights of steel plate, fractions and decimal equivalents from one-eighth inch to 11⅞ inches. Equivalent measurements of gallons, cubic feet and barrels are given with their weights in water.

For a calculator write Department WO, Hammond Iron Works, 630 Fifth Avenue, New York City 20, *referring to* WORLD OIL *item* 145.

146—Fire Hose

A six-page catalog section on industrial fire hose details the methods and materials with which all Goodrich fire hose is constructed, and advantages of its use. It pictures each of the brands of industrial fire hose, gives data on size, couplings and test pressures, and weight coupled and uncoupled for 50-foot lengths. Gaskets, fittings and couplings used with the hose are also described.

For a copy of this catalog section, write The B. F. Goodrich Company, Akron, O., *referring to* WORLD OIL *item* 146.

147—Oil Well Pumping Control

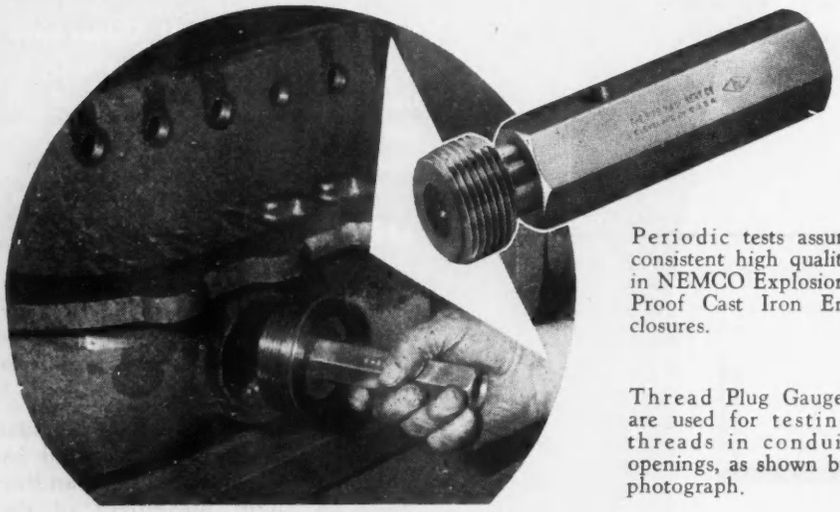
A new four-page folder describes Cutler-Hammer oil well pumping control, designed for across-the-line starting of squirrel cage motors. Built-in lightening arrestors provide protection for the controller and long incoming power lines. Geared to oil well capacity or operating schedule, a program time switch automatically controls the timing cycle of the pumping unit. On-off operation is provided in 15 minute periods throughout the day and night.

For a copy of Publication CS-211, write Cutler-Hammer, Inc., 414 N. 12th St., Milwaukee 1, Wis., *referring to* WORLD OIL *item* 147.

148—Traveling Blocks

"A Better Traveling Block for Every Purpose" is a new bulletin which illustrates and describes McKissick traveling blocks. Charts and diagrams are included in bulletin TB-1949.

For a copy of this bulletin, write McKissick Products Corporation, Box 2496, Tulsa, *referring to* WORLD OIL *item* 148.



Periodic tests assure consistent high quality in NEMCO Explosion-Proof Cast Iron Enclosures.

Thread Plug Gauges are used for testing threads in conduit openings, as shown by photograph.

A "BOX FULL" OF *Quality*

Consistent high quality in NEMCO Explosion-Proof "Boxes" or Enclosures is attained by means of periodic tests which are applied during manufacture.

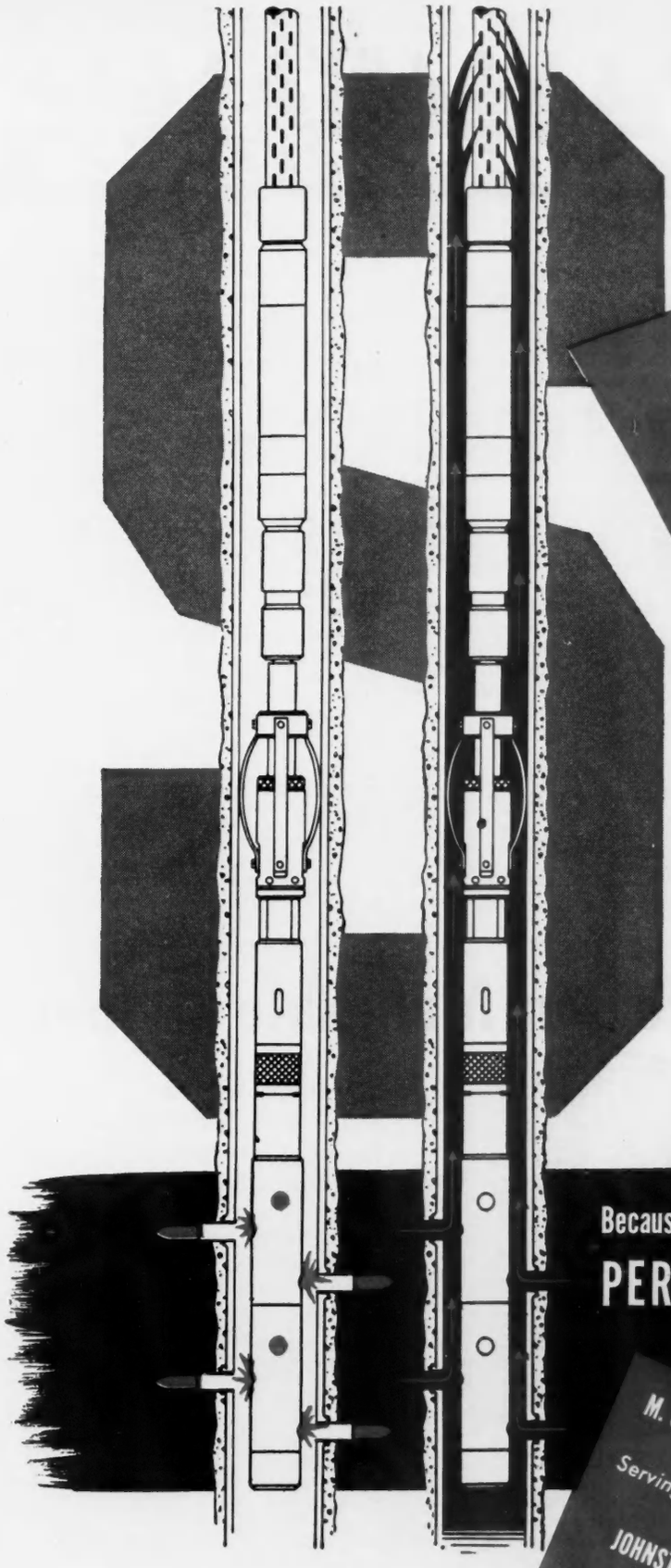
One such test is illustrated above. Note that Thread Plug Gauges are used for checking the threads in the conduit openings. When a thread proves faulty, the box is rejected.

NEMCO Explosion-Proof Cast Iron Enclosures are designed for Class 1, Group D, Hazardous Locations and can be furnished with air circuit breakers, combination motor starters, lighting switches, etc. Let us quote on your requirements.

NELSON *Electric* MANUFACTURING CO.

217 North Detroit TULSA, OKLAHOMA Telephone 2-5131

Manufacturers of: Explosion Proof Motor Controls, Junction Boxes and Enclosures, Circuit Breakers and Lighting Panels, Oil Field Motor Controls, Automatic Pipe Line Sampling Devices, Cathodic Protection Equipment, Switchboards, Instrument and Control Panels, Unit Substations.



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- Saves wear and tear on equipment
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The Johnston "Shoot-N-Test" Gun Perforator at moment of fire.

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A QUICK, POSITIVE LOAD REGARDLESS OF FLUID LEVEL.
Ideal also for fishing small objects—widely used for drilling in (completing) wells, and for drilling cement or plastic plug overages.

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Program Is Announced for Annual Meeting of AAODC

Titles have been announced of papers to be presented at the Ninth Annual Meeting of the American Association of Oilwell Drilling Contractors, to be held September 19-21 in Dallas.

Carl Reistle, Humble Oil & Refining Company, Houston, will talk on "Review and Outlook for the Contractor" at the Monday morning session, following the president's address by Joseph S. Morris, Allen and Morris, San Antonio.

At the Tuesday, September 20, general session, C. A. Oberg, Standard Oil Company of California, San Francisco, will speak on "The Balanced Rotary Rig." Ralph W. Marshall, Drilling & Exploration Company, Inc., Los Angeles, will discuss "Contractor's Response"; W. C. Morris, Allen and Morris, and Hamilton Rogers, Rowan Drilling Company, Fort Worth, "Drilling Contract Forms," and Earl A. Brown, Magnolia Petroleum Company, Dallas, "Operator's Response."

"Rig to Office Communications" is the title of a paper by C. J. Paine, Paine Drilling Company, Dallas, and Jerry Stover, communications consultant, Dallas, to be presented at the Wednesday morning general session. Also scheduled for that time are "Diamond Core Bits," by R. B. McCloy, Stanolind Oil and Gas Company, Tulsa, and "Hydraulic Power Transmitters," by Nicholas A. D'Arcy, Jr., Huntington Park, Calif.

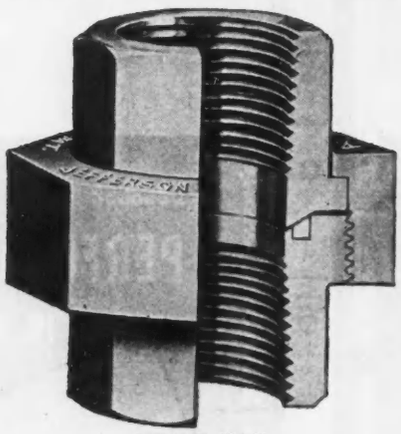
Bruno Schabarum, Carl B. King Drilling Company, Midland, Texas, and Stanley Moore, Drill Collar Service Company, Midland, are authors of a paper on "Selection of Drill Stem," to be read at the Wednesday afternoon session.

Other events planned for the conference include committee meetings Monday afternoon, a speech by J. L. Hamon, Cox and Hamon, Dallas, at the Tuesday luncheon, and a banquet Wednesday evening.

Pioneers Hold Barbecue

The Petroleum Production Pioneers will hold their barbecue September 10 at the Kern County Golf Course, near Bakersfield, Calif., according to Russell Green, president of the organization.

Jefferson Malleable Unions



STYLE "A"

JEFFERSON Style "A" Unions and Style "A" Union Fittings can be furnished with Brass-to-Iron, and Iron-to-Iron Seats.

HYDRAULIC PRESSURE RATING

Sizes	*Test Pres.*	*OWG*	*SWP*
⅛" thru 2"	4000#	1500#	500#
2½"	3000#	1200#	300#
3" thru 4"	2000#	800#	300#

Our "Iron-to-Iron seat" unions are highly recommended and especially desirable where sulphur content of oil is high; also for chemical services where acid-bearing liquids or gases require the use of iron fittings. AIR FURNACE IRON, having a much denser and finer grain structure, gives a dependable and positive seating surface—ASTM-4733-Grade 35018-53000-lb. M.T.

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Take Out Bigger Payloads
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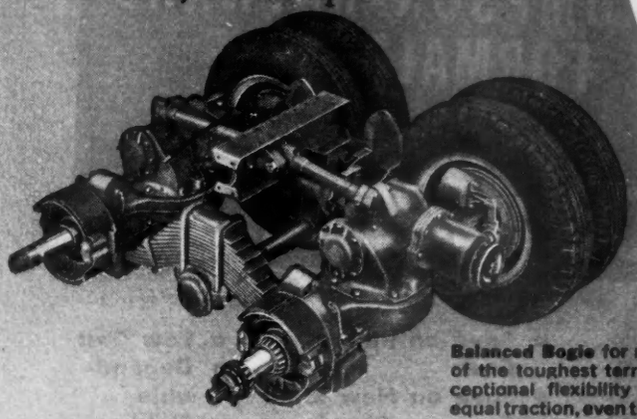
Duplex Transmission. Four-speed main transmission and two-speed compound assembled as a unit. Provides eight forward and two reverse speeds. Most rugged and efficient truck transmission in standard production today.

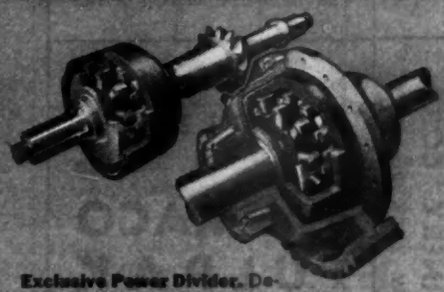
• In every part, Mack trucks are built to "take it" when it comes to taking out bigger loads with utmost economy!

Here are some of the "inside reasons" why Mack trucks build profits for you by hauling bigger tonnage on faster, uninterrupted schedules.

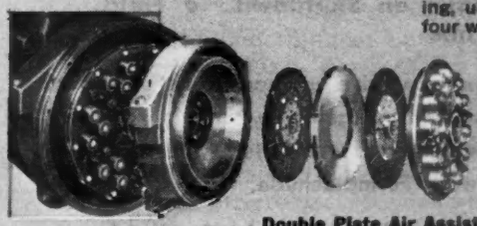
Massive Frame electrically fused into single unit. Alloy-steel I-beam side members are reinforced and braced by huge cross members. Capable of carrying great loads and standing up under tremendous shock.



Balanced Bogie for mastery of the toughest terrain. Exceptional flexibility insures equal traction, even tire loading, uniform braking on all four wheels.



Exclusive Power Divider. Delivers torque proportionately to wheels having the most traction. Eliminates dissipation of power in useless slippage and wasteful wheel spinning.



Double Plate Air Assist Clutch. Effortless in operation, reduces driver fatigue, requires minimum maintenance throughout its long life.

IT'S PART OF THE LANGUAGE:

"Built Like a Mack Truck"

Mack Trucks, Inc., Empire State Bldg., New York, N.Y. Factories at Allentown, Pa.; Plainfield, N. J.; New Brunswick, N. J.; Long Island City, N. Y. Factory branches and dealers in all principal cities for service and parts. In Canada: Mack Trucks of Canada, Ltd.

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KANT-GALL TOOL JOINT COMPOUNDS

EXCLUSIVE 500-TON SPECIAL

LONG-LIFE DRILL COLLAR COMPOUND

You can always break the joint when you use Jimmie Gray Compounds! That's because each one is engineered to do certain specified jobs best! You can depend on their thread-protecting film to prevent galling and washouts, too. Satisfaction is assured thru the famous Jimmie Gray money-back guarantee!

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ASSOCIATIONS

TRANSPORT ASSOCIATION OFFICERS—New directors and officers of the Petroleum Motor Transport Association of Oklahoma, elected at the annual meeting held in the shops of the Oklahoma Natural Gas Company at Tulsa, are, from left to right, R. C. Hopper, Skelly Oil Company, director; C. E. Jackson, Mid-Continent Petroleum Corporation, second vice president; W. H. Esser, Shell Oil Company, Inc., director; H. J. Chambers, Oklahoma Natural Gas Company, president; J. W. Rayborn, Tide Water Associated Oil Company, director; H. E. Thompson, Stanolind Oil and Gas Company, secretary-treasurer; G. L. Wheatley, Cities Service Oil Company, director. Not shown is Dal Clark, Stanolind Pipe Line Company, first vice president.

Houston Geologists Choose Consultant as President

New president of the Houston Geological Society is Hershal C. Ferguson, consulting geologist, formerly vice president. Other officers elected were vice president, R. R. Rieke, Schlumberger Well Surveying Corporation, and secretary, James H. McGuirt, Tidewater Associated Oil Company.

Ferguson succeeds A. F. Childers, Jr., Gulf Oil Corporation, who becomes an ex-officio member of the advisory committee. Other committeemen elected were Frank Reedy, Jr., Crown Central Petroleum Corporation, Jack O. Colle, consulting geologist, and Dan E. Boone, Aetna Oil Company.

PARKERSBURG MACHINE Co. PARMACO PARKERSBURG, W. VA. U.S.A.

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EXCLUSIVE EXPORT DISTRIBUTOR
PETROLEUM MACHINERY CORP.
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★ Quicker Acting!
★ More Economical!

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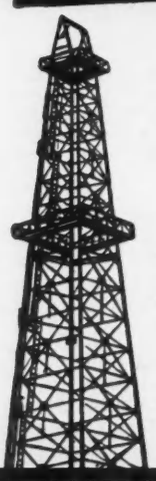
PARKERSBURG MACHINE COMPANY
PARKERSBURG, W. VA.

THOMPSON-HAYWARD FORMALDEHYDE
Reduces
CORROSION



- Save on Pulling Costs
- Save on New Steel
- Save on Shutdown Time
- Low Cost
- Dependable
- Field Tested

Protect expensive and hard-to-get steel parts from hydrogen sulphide corrosion and corrosive mine and well waters, with Thompson-Hayward Formaldehyde.

Warehouse Stocks Available For Prompt Shipment

THOMPSON-HAYWARD CHEMICAL CO.
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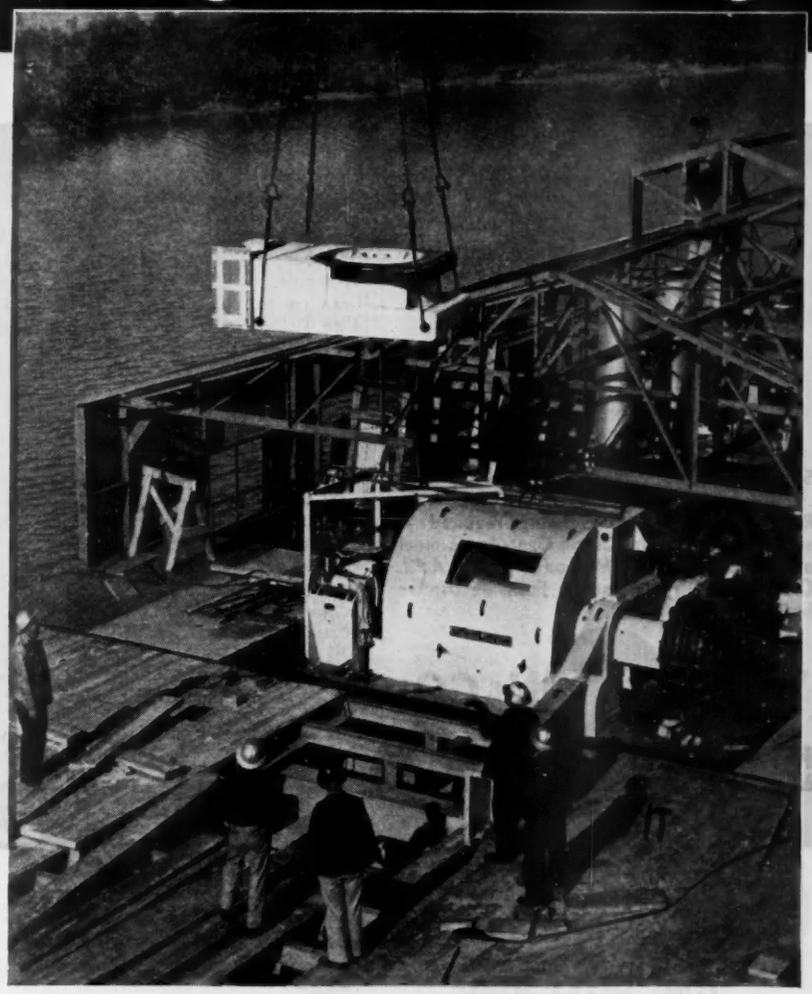
So you're planning a drill barge!

Here's a suggestion: talk first with Bethlehem. For Bethlehem is equipped to do the WHOLE job—build the barge complete, build and install the drilling machinery, handle the piping, outfit everything.



An all-Bethlehem barge job under construction. This is a section of the main deck with the draw works in place; the rotary is being lowered into position. Below, out of sight, are the pumps.

The advantages of barge drilling in shallow inland waters are now so well recognized that they scarcely need detailing here. Whereas a platform outfit may be inoperative for weeks while equipment is being dismantled, moved, and rigged up, the self-contained barge plant can be moved as a unit and often be ready to resume in a matter of hours.

Equally well recognized are Bethlehem's facilities for producing "turnkey" barge jobs—jobs in which Bethlehem builds, supplies, and handles everything, down to the last detail. In our Gulf Coast yards Bethlehem shipbuilders engineer and fabricate the barge; from Bethlehem Supply come the specified items of rotary-drilling equipment, which are installed as the barge work progresses. Meanwhile, Bethlehem's purchasing division, with a deep background of experience, is buying the proper types of accessories and furnishings. When the job is delivered to the customer, it is *ready for work;* ready to be towed away at once to its first drilling assignment.

Think what this means! *One* responsibility—ours; we answer to you for everything. Gone are the worries and complications that are almost inevitable when you deal with a number of unrelated companies.

Your Bethlehem turnkey job will be as modern as today—up-to-the-minute from barge bottom to gin pole. It will serve you well for years to come. Our engineers will be glad to show you what we have done—and can do for *you*—in building and outfitting barges for marine drilling.

BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY

Shipbuilding Division

GULF COAST YARDS: BEAUMONT, TEXAS

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QUICK, ACCURATE RESULTS
LESS EFFORT
Curtin CENTRIFUGES

No. 3420
15 c.c. machine . . .
Cranks and heads interchangeable with 100 c.c. machines.

Simple in design . . . Ruggedly built . . . Requires no special care . . . Great Ratio and throw of crank produce required speed with no strain. Curtin Centrifuges meet all *A.S.T.M. Standard Method D-96* and *A.P.I. Code No. 25* requirements. Fully descriptive literature upon request.

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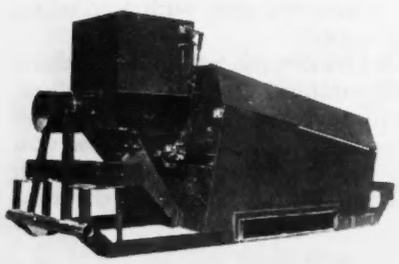
HOUSTON . . . . NEW ORLEANS.

S-I-W ROTATING MUD SCREEN

THE MUD SCREEN THAT GIVES SHALE A ONE-WAY TRIP!

Practical men build the S-I-W Rotating Mud Screen to completely remove shale from drilling mud as it flows from the hole. Its cone-shaped screen is roller-bearing mounted, and precision balanced to revolve with the force of mud falling from as little as a one-inch pipe onto the power screen. The S-I-W Mud Screen is made in two sizes, of rigid construction, with mud by-pass and sample catcher! Send for details!



Sunshine Iron Works
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ASSOCIATIONS

Papers Are Listed for NACE South Central Region Meeting

Eight technical papers on various corrosion problems, a panel discussion and various committee meetings have been scheduled for the annual meeting of South Central region, National Association of Corrosion Engineers, at the Adolphus Hotel, Dallas, October 3-4.

A panel-type discussion will be devoted to problems in pipe lines, refining, chemical, water works, production, transportation and other industries. L. F. Scherer, The Texas Pipe Line Company, Houston, will be moderator. Other members of the panel include F. L. LaQue, The International Nickel Company, Inc., New York; W. F. Rogers, Gulf Refining Company, Houston; William E. Huddleston, Huddleston Engineering Company, Bartlesville, Okla., and Bruce L. Corey, Socony-Vacuum Oil Company, Inc., Topeka, Kansas.

The titles of the papers and authors: "Causes of Corrosion in Airplanes and Methods of Prevention," N. H. Simpson, Consolidated Vultee Aircraft Corporation, Fort Worth; "Selection of Protective Coatings for Fume Resistance," C. C. Harvey, Ethyl Corporation, Baton Rouge; "Internal Corrosion of Crude Oil Tanks," W. H. Crenshaw, American Inspection Service, Midland, Texas. This paper is sponsored by the Permian Basin Section NACE, members of which are assisting in collecting data.

"Control of Vapor Zone Corrosion in Storage Tanks by the Use of Ammonia," S. T. Gardner and A. T. Clothier, The Carter Oil Company, and Francis Coryell, Interstate Oil Pipe Line Company, Tulsa; "Corrosion Control on Gas and Water Distribution Systems in Texas Low-Rent Housing Projects," C. R. Goodrich, Fort Worth; "Thermofor Catalytic Cracking Gas Plant Corrosion Survey," C. A. Murray, The Pure Oil Company, Nederland, Texas; "Combating Corrosion in a Chemical Plant with Magnesium Anodes," Oliver Osborn, The Dow Chemical Company, Freeport, Texas; "Application of Magnesium Anodes to Pipe Line Protection," J. A. Holloway, Houston Pipe Line Company, Edna, Texas.

Arrangements Chairman Named For 1950 API Annual Meeting

The Western Oil and Gas Association has appointed Clarence S. Beesemyer, executive vice president of General Petroleum Corporation, Los Angeles, as general chairman of the committee in charge of arrangements for the 1950 Annual Meeting of the American Petroleum Institute. More than 5000 oil men are expected to attend the meeting which convenes in November, 1950.

Here's the *Proof* of Preference for WISCONSIN HEAVY-DUTY *Air-Cooled* ENGINES

4 Out of 10 Carburetor Type Engines made in 1947 in 2 to 30 H.P. Range were WISCONSINS!

According to an official bulletin issued on April, 22, 1949 by The Bureau of Census, Dept. of Commerce (Preliminary Industry Report, Series MC-31D, covering the production of Internal Combustion Engines for the year 1947) 40.2% of all carburetor type engines within a cu. in. displacement range from 11.0 to 175.9 were Wisconsin Air-Cooled Engines.

The summary includes data received by the Census Bureau from 134 engine manufacturers. The tabulation of the 9 groups within the above displacement range, representing 528,063 units, allocates 212,174 units to Wisconsin, or an average of 40.2% of the total production.

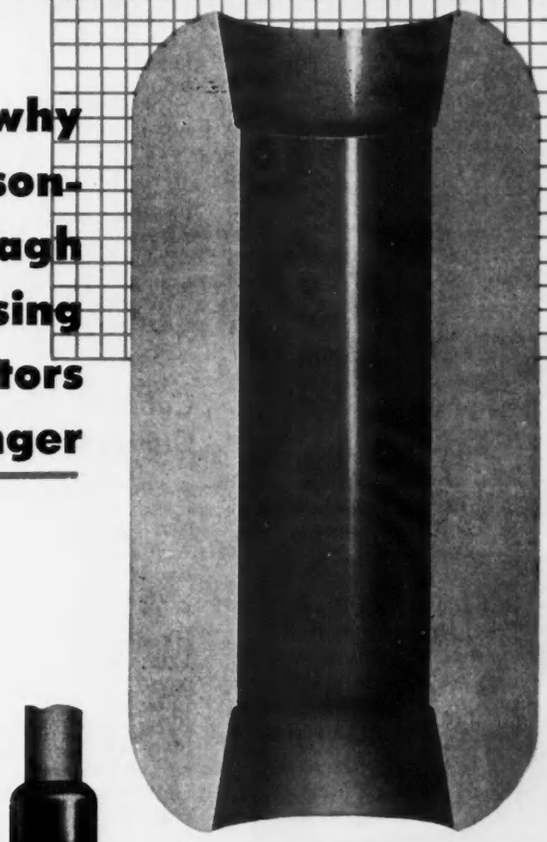
These figures speak for themselves . . . in terms of outstanding preference for Wisconsin Air-Cooled Engines among power users in all fields.

WISCONSIN MOTOR Corporation
MILWAUKEE 14, WISCONSIN
World's Largest Builders of Heavy-Duty Air-Cooled Engines

WRITE TO HARLEY SALES CO.
510 Atlas Building, Tulsa, Oklahoma
M & M Building, Houston, Texas
Oil field distributors for Wisconsin Engines and all types of utility units.

Cross Section of Quality

or why Patterson-Ballagh Casing Protectors last longer

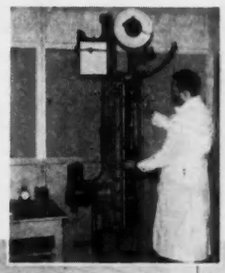


These tapered recesses allow less stretching at the ends, keeping stress here less than in thick body when Protector is installed, thus eliminating tearing at this vulnerable point.

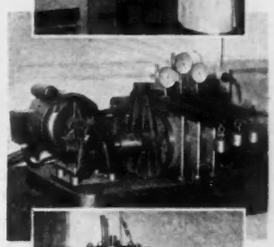
Quality Protectors come from quality workmanship in the shop and laboratory. This new shock-proof, tear-resistant Casing Protector represents endless hours of testing in both laboratory and field. Now it is *field proven* and ready for your drill pipe.

This new design meets the rough use and abuse of deep drilling. Engineers know that rubber under less stress will withstand more shock and tearing action than highly stressed rubber. Since the ends of a protector take the greatest beating down the hole, the tapered ends of the new Patterson-Ballagh Protector are not stressed as highly as the body, yet they grip the drill pipe firmly and prevent any fluid from getting between the rubber and drill pipe. These resilient ends allow the Protector to absorb shock and resist tearing action at this point.

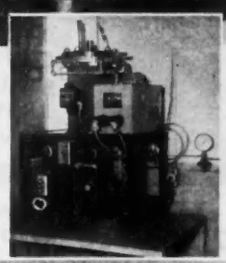
To further insure proper rubber stress, *every Protector is designed for one, and only one, size drill pipe.* Call your Patterson-Ballagh man and have a new Protector installed on every length of drill pipe.



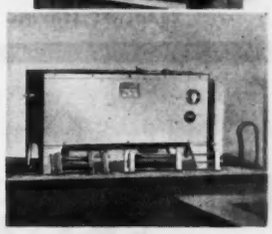
Tensile testing machine tests rubber samples from each batch of rubber to insure quality control.



This machine tests the abrasion-resistance of rubber samples—another example of why we know our Protectors will give long wear.



Rubber samples are aged, equivalent to two years, in a few hours time in high pressure oxygen ageing equipment.



The resistance of rubber under tension to hot oil is determined in this bath that simulates actual operating conditions.

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Program Is Announced for NPA Atlantic City Meeting

Relations between the petroleum industry and the public, and the government and the industry, will be discussion topics at the 47th Annual Meeting of the National Petroleum Association at Atlantic City September 14-16.

Scheduled speakers at the general sessions are Association President W. S. Zehrung of The Pennzoil Company; Conger Reynolds of Standard Oil Company of Indiana and chairman of the Oil Industry Information Committee, who will discuss the oil industry's public relations and the work of the committee; Alexander Fraser, president of Shell Union Oil Corporation, who will talk on the impacts of traffic congestion on the oil business; Robert E. Freer, formerly a member of the Federal Trade Commission, who will speak on geographical pricing, the basing point problem, and the implications of the Detroit Oil Jobber case; and Charles M. Brooks, formerly associate general counsel of the NRLB and now labor relations attorney for The Texas Company, who will talk on the government and labor relations.

Walter J. Levy Resigns ECA Petroleum Branch Position

Walter J. Levy has resigned as chief of the Petroleum branch of the Economic Cooperation Administration, it was announced by Paul G. Hoffman, ECA administrator. A successor has not yet been named.

Levy, who originally accepted the ECA post in July, 1948, for a six-month period, agreed to continue for the remainder of the year at the request of Administrator Hoffman. He has now agreed to serve as a consultant to Hoffman on special petroleum problems. He is leaving ECA to act as an economic consultant with offices in New York City.

California Conservation Group Names Committees

The Conservation Committee of California Oil Producers has elected its two standing subcommittees. The new Administrative Committee consists of Bruce H. Robinson, of General Petroleum Corporation, chairman; Chester F. Dolley, Atlantic Oil Company; H. G. Henderson, Severns Drilling Company, Ltd.; Wm. L. Hobro, Shell Oil Company, Inc.; and Lloyd Williamson, Lakeport Petroleum Company.

The new Engineering Board consists of C. W. Stephens, The Ohio Oil Company, chairman; E. A. Galvin, Western Gulf Oil Company; C. F. Gates, General Petroleum Corporation; Wayne Glenn, Continental Oil Company; O. A. Graybeal, Barnsdall Oil Company; Joseph Jensen, Tide Water Associated Oil Company; J. M. McNeill, Union Oil Company of California; M. T. Miller, Standard Oil Company of California; L. R. Rogers, The Superior Oil Company; and E. R. Smith, Seaboard Oil Company of Delaware.

API Advisory Committee Chairmen Are Appointed

T. V. Moore, of Standard Oil Development Company, New York City, and H. G. Vesper, of California Research Corporation, San Francisco, have been appointed chairmen of two American Petroleum Institute advisory committees on fundamental research.

Moore succeeded Earl G. Gaylord as head of the Advisory Committee on Fundamental Research on the Occurrence and Recovery of Petroleum, and Vesper succeeded W. J. Sweeney as chairman of the Advisory Committee on Fundamental Research on Composition and Properties of Petroleum.

LPGA Sponsors Service School

The Liquefied Petroleum Gas Association is sponsor of the second annual Eastern LP-Gas Service School to be held September 7-9 at the University of Pittsburgh. Instructions will be given in the fundamentals of LP-Gas operations as well as the latest technical, service and commercial developments.

The WILSON SUPPLY-INGERSOLL-RAND *Packaged-Portable* COMPRESSORS

The photograph above shows FOUR Wilson Supply—Ingersoll-Rand Packaged Portable Compressors—leaving the plant in Houston—headed for South Texas.

In a matter of hours these four machines will be "In Service," as they require only the connecting of suction and discharge line, to be put in operation.

The Packaged Portable Units are available in both "Single Stage" and "Two Stage" and in sizes ranging from 10 H.P. to 140 H.P.

Especially adaptable for gas—oil lift, repressuring and pressure maintenance—these Portable Units take the place of far more costly permanent installations. They afford a worthwhile saving on simplicity of maintenance and availability of service.

Check your needs NOW—and let our engineers work with you on how they can best be met with these PROVEN PERFORMANCE UNITS.

For complete information on this worthwhile equipment, address Compressor Division, Wilson Supply Co., P. O. Drawer 19, Houston, Texas.

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Tulsa, Oklahoma; Dallas, Texas.

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BRANCH STORES: TEXAS—Alice, Corpus Christi, Victoria, Bay City, Columbus, Barbers Hill, Beaumont, Kilgore, Monahans, LOUISIANA—Lake Charles, New Iberia, Houma, Harvey, Shreveport, ARKANSAS—Magnolia.

141 YEARS IN PERU—These nine men, who attended the Petroleum Production Pioneers Barbecue at the Shell Barbecue Grounds near Brea, Calif., have spent a total of 141 years in Peru. All but the three Fowks worked for International Petroleum Company in northern Peru. From left to right are Lee Chisholm, ten years in Peru; Thomas A. Murray, 40 years and an ex-mayor of Talara, Peru; E. B. Fowks, seven years; A. S. Fowks, nine years; A. E. (Pop) Fowks, 32 years; R. B. Block, 12 years; A. Norcott, 17 years; F. D. Ashton, nine years; and S. P. Duffield, five years.

Oil Papers Scheduled for School Anniversary Program

Petroleum subjects are included on the program for the Colorado School of Mines' 75th Anniversary observance September 29, 30 and October 1 at Golden, Colo. Theme of the conference will be "Mineral Resources in World Affairs."

Papers on geophysics, petroleum geology and petroleum production will be presented at conferences Friday and Saturday.

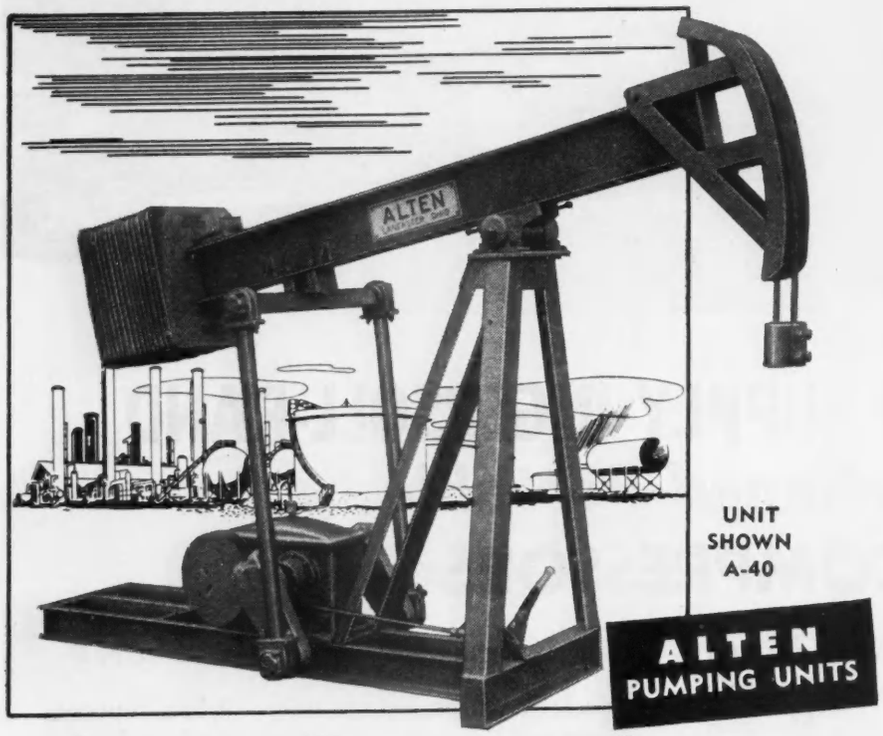
Tulsa Engineers Club Elects Ernest M. Newland President

Ernest M. Newland, sales engineer, Oklahoma Steel Casting Company, has been elected president of the Engineers Club of Tulsa.

Other officers-elect are M. J. Myers, Jr., industrial engineer, Public Service Company of Oklahoma, executive vice president; P. P. Manion, proration supervisor, Stanolind Oil and Gas Company, treasurer; Jack H. Beasley, division sales manager, Baroid Sales Division, National Lead Company, vice president programs; Dale G. Savage, civil engineer, Stanolind Pipe Line Company, vice president membership; W. R. Clarke, sales engineer, Jones and Laughlin Supply Company, vice president entertainment; L. L. Dresser, president, Dresser Engineering Company, vice president public relations; John P. Hammond, petroleum engineer, Amerada Petroleum Corporation, and J. Ray Polston, general manager, Stanolind Pipe Line Company, directors.

PEPA Will Meet in Beaumont

The Petroleum Electric Power Association will hold its annual conference November 17-18 at Hotel Beaumont, Beaumont, Texas.



Check 'em for cost

By cost, we mean more than selling price. Compare Alten Units with any others—on economical production, upkeep, freedom from break-downs, long life. Many oil men who have made such cost comparisons rate Alten tops. Use them for money-saving operation.

Also Casing Heads, Stuffing Boxes, Stop Cocks and other production items.

A-40 FEATURES

★Rigid, all-welded steel Samson Post, Frame and Beam. Structural rating: 4,000 lbs.

★Quality Gear Reducer. Hardened alloy gears and pinions. Roller-bearing equipped. Double reduction ratio: 33.2:1. Torque rating: 17,500 in. lbs.

★Adjustable stroke length: 17" to 23".

★Wrist Pin and Equalizer has double-row, spherical, self-aligning roller bearings.

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FOUNDRY & MACHINE WORKS, INC.
Lancaster, Ohio
Established 1889
Ask for Name of Nearest Dealer

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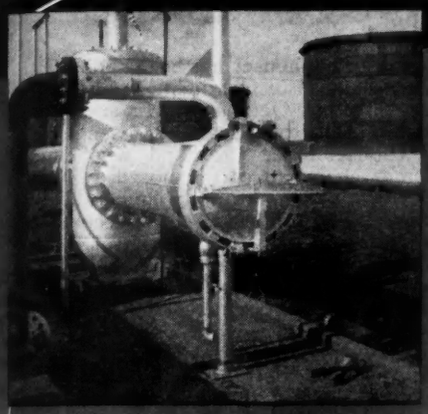
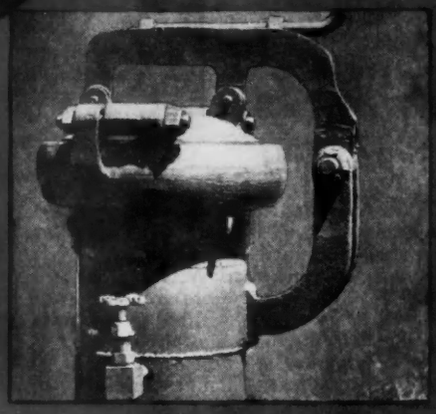
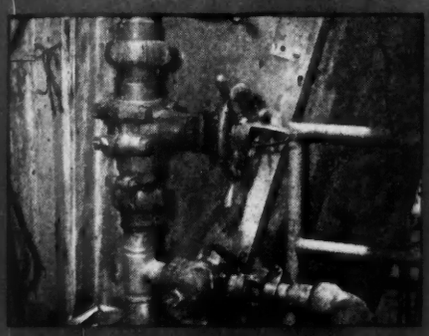


28-Inch Hinged UNIBOLT Scraper Trap

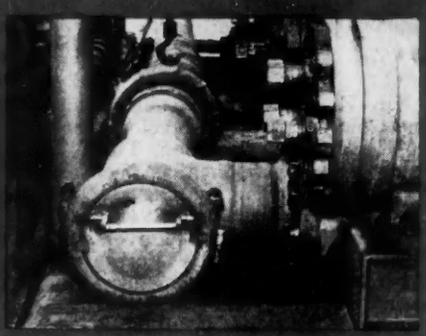


Hinged UNIBOLT Gas Pipeline Blow-Down

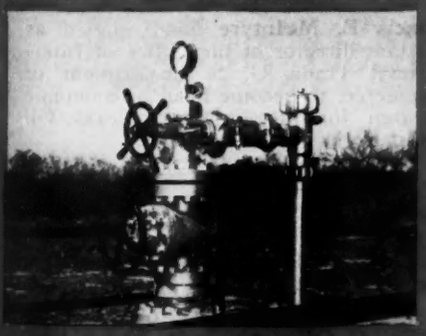
UNIBOLT Christmas Tree Cross with Blanking Plugs Tapped for Pressure Gauge



Mud Line Valves Equipped with UNIBOLT Couplings



UNIBOLT Slush Pump Strainer



UNIBOLT Flow Manifold

On any pipe connection . . . in any oil industry service . . . where flanged unions or closures are now employed, *UNIBOLT provides a better way to do the job.*

UNIBOLT provides a safer, stronger, joint because the unique UNIBOLT design places more metal in shear.

UNIBOLT provides a light-weight, less bulky unit which is economical, completely salvageable and interchangeable.

UNIBOLT provides a more convenient connection or closure because of its time-saving design, and blanking plugs which are available with a hinge to facilitate opening and closing.

UNIBOLT couplings are easily installed in hard-to-get-to places.

A few typical applications of UNIBOLT Couplings are presented herewith. See your Composite Catalog for complete mechanical details and other recommended UNIBOLT services.

THORNHILL-CRAVER CO.

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PAA

Men in the Industry NEWS

David A. Shepard

Howard W. Page

David A. Shepard has been made executive assistant to **Eugene Holman,** president of Standard Oil Company (N.J.). He succeeds **Howard W. Page,** who has been made shareholders' representative for affiliates in the United Kingdom.

Shepard has been shareholders' representative and chairman of the board of directors of Anglo-American Oil Company, Ltd.

»

Reginald C. Warner has been named assistant manager of the Marine department of Standard Oil Company of California. For many years a chief engineer on vessels of Standard's tanker fleet, Warner has more recently acted as inspector of operations and maintenance for the company's Marine department. During the last ten years he also has supervised construction, here and abroad, of tankers and petroleum barges for Standard and some of its subsidiary companies.

Warner joined Standard in 1921 as a first assistant engineer. In his new position he replaces **A. E. Kihn,** recently named manager of Standard's Marine department.

»

John E. Nelson, director and executive vice president of Gulf Oil Corporation, has retired. He is succeeded by **E. C. Bothwell,** a vice president of the company since 1935.

John E. Nelson

In 1902, Nelson became secretary to **Andrew W. Mellon,** one of the founders of Gulf. He joined Gulf in 1908 as secretary to **W. L. Mellon** and assistant treasurer. He was elected treasurer in 1922 and vice president and treasurer in 1939. In August, 1941, he was elected to the board of directors and in May, 1948, he became executive vice president.

Bothwell has been in charge of Gulf's production and exploration activities, both domestic and overseas. He joined the company's Production office in Tulsa in 1915. The following year he was made assistant to the vice president in charge of production.

K. C. Heald will assist Bothwell with respect to overseas operations and will be in charge of production and exploration activities in the U. S. and Canada. He has been a Gulf vice president since 1945. Heald joined the company as staff geologist in 1924, after having served with the U. S. Geological Survey, and as an associate professor of geology at Yale University.

»

Lloyd F. Thanhouser has been appointed general counsel of Continental Oil Company, effective October 1. He succeeds **James J. Cosgrove,** who has been general counsel since 1929 and who now becomes chairman of the board.

Burney Braly, formerly general attorney for Continental, has been appointed associate general counsel.

Thanhouser, a partner in the New York law firm Satterlee, Warfield and Stephens, has specialized for several years in corporate work and civil litigation.

Braly joined Continental in 1926 and was made general attorney for the Company at Fort Worth in 1928.

»

John O. Galloway resigned as executive vice president of Standard Oil Company of California and will open an office in Calgary, Alberta, as a petroleum consultant, specializing in exploration and development. Galloway has been in charge of exploration and development in western Canada for California Standard since 1938. He is a graduate of the University of Oklahoma in geology and petroleum engineering.

John O. Galloway

»

Dr. Nils K. Anderson has been named director of research and development for Deep Rock Oil Corporation, Tulsa. For the past three years he has been associate professor of engineering at Northwestern University. From 1941 to 1946 he was on the staff of Universal Oil Products Company. His headquarters will be at Cushing, Okla., where a new research building has been erected at the Deep Rock refinery. Other research staff members include **Dr. Delton R. Frey** and **Jesse B. Jackson, Jr.**

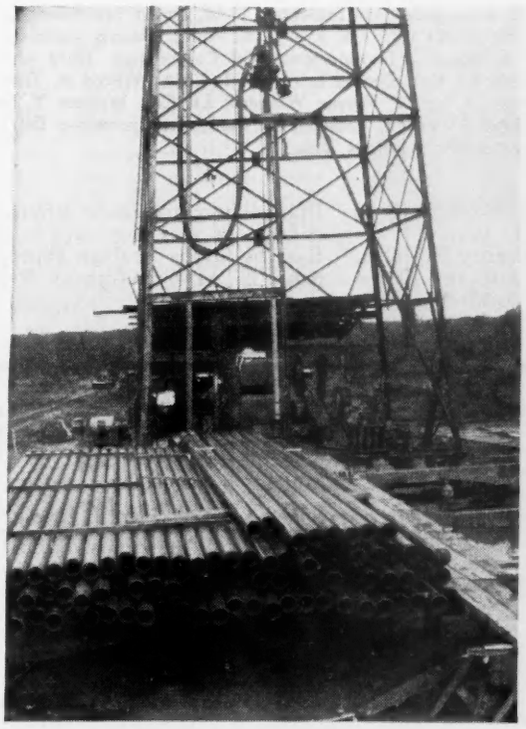
»

Francis E. McIntyre has resigned as assistant director of the Office of International Trade, U. S. Department of Commerce, to become head of economic research for the California-Texas Oil Company in New York City.

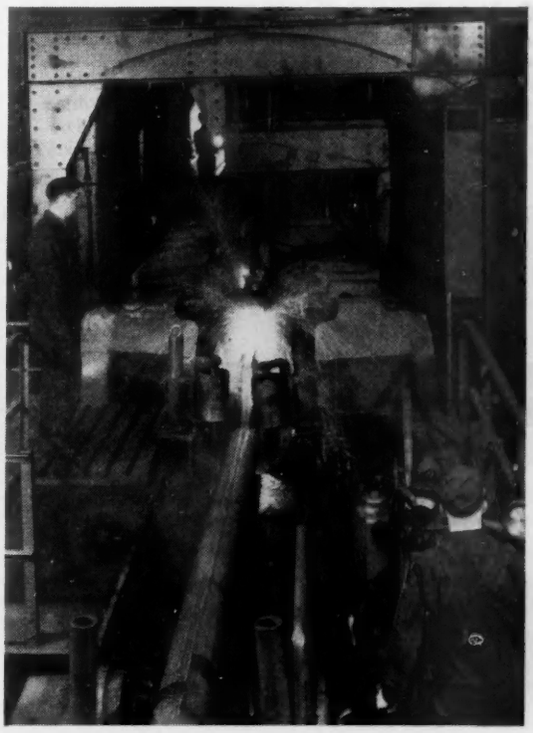
»

Harry Hines, veteran oil man of the Mid-Continent area, has opened an office in the Equitable Building, Denver, for operations in the Rocky Mountain area.

DEPENDABILITY THROUGH RESEARCH AND ENGINEERING



IN A TEXAS FIELD: running 4300 feet of 7-inch S-80 SMITHway Casing.



IN THE A. O. SMITH PIPE MILL: this automatic flash-welding machine, developed by A.O. Smith research, simultaneously welds SMITHway Casing along its full length.

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Houston 2 • Seattle 1 • Los Angeles 14 • International Division: Milwaukee 1

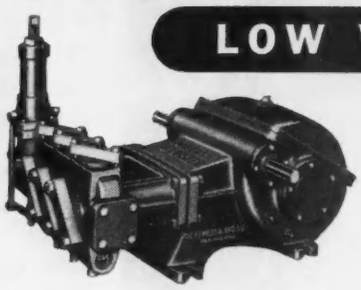
INSPECT ESSO PLANT—Active members and guests of the petroleum unit, Potomac River Naval Command of the U. S. Naval Reserve, are pictured on inspection tour of the Esso Refinery, Baltimore. Left to right are, front row, Lt. Cdr. Carl W. Kelly; Lt. Cdr. James H. Collins; Lieut. Sidney Ritt; Lieut. E. J. Ceconi; Lt. Cdr. William R. Bailey; William H. Long, public relations, Esso. Second row, Lieut. T. C. Snedeker; Lawrence Thompson, resident inspector of naval material; Milton H. Booker, U. S. Army petroleum inspector; Lieut. Forest Tranthum; Cdr. Clarence W. Hoffer; Lt. Cdr. J. R. Ryan; Cdr. Paul L. Hopper, commanding officer; W. E. Reggins, Transportation Oil Corporation. Third row, Cdr. J. C. Moore; Lt. Cdr. Donald L. Nowwell; Capt. Wilfred H. Troup, U. S. Air Force; Lt. (jg) E. Wayne Wingerd; Lt. Cdr. William Y. Webb; Lieut. Richard S. Mason; Clarence E. Buck, Transportation Oil Corp.; L. B. Parks, public relations, Esso.

Cortlandt S. Dietler has been made a director and officer of Williams-Copeland, Inc., drilling contractors of Tulsa. Dietler was formerly Rocky Mountain representative for The Toronto Pipe Line Company in Casper, Wyo.

A graduate of the University of Tulsa, Dietler served overseas with the Corps of Engineers during World War II. Immediately following graduation from college, he was employed in the Middle East by Trans-Arabian Pipe Line Company in its Government Relations department.

HIGH PRESSURE

LOW VOLUME



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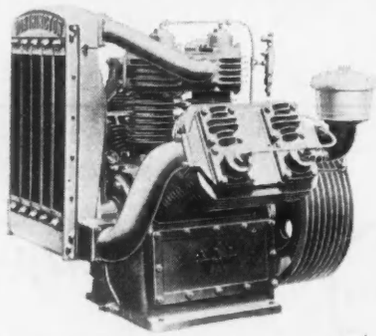

CAPACITIES 142 CFM to 530 CFM

PRESSURES to 125 lbs.

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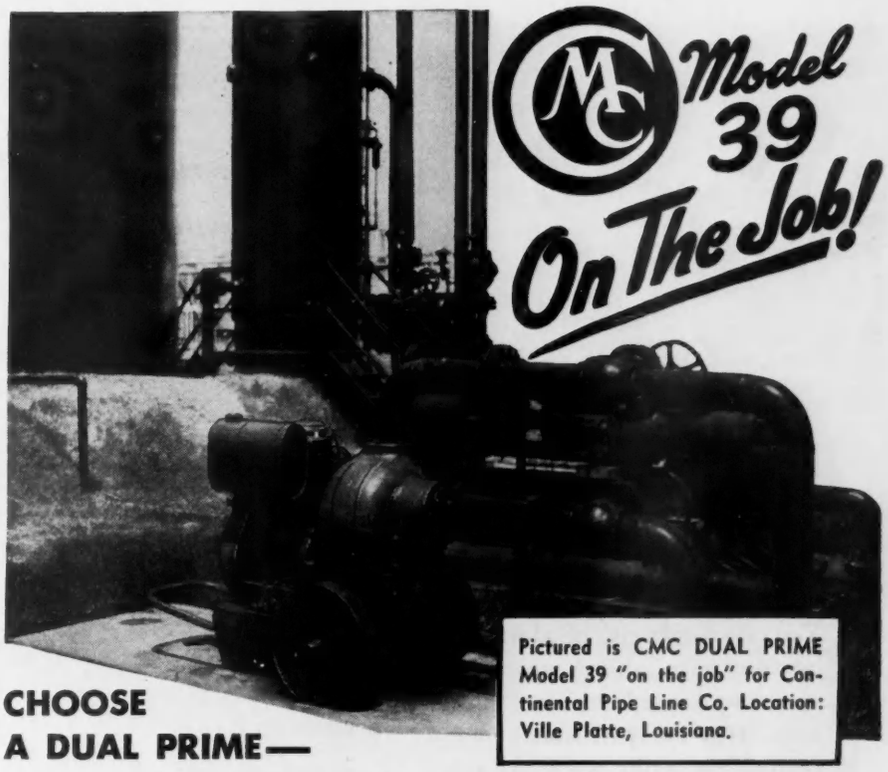
HOUSTON NEW ORLEANS DALLAS

Transfers and Promotions:

Richard P. Ryan, Legal department, The Carter Oil Company, has been transferred from Tulsa to the Northwest division at Denver. . . . **C. Edwin Mohler,** National Associated Petroleum Company, Tulsa, has been promoted from assistant to chief geologist, succeeding the late **B. A. Lilienborg.** . . . **Keith L. Rising,** scout for Shell Oil Company, has been transferred from Tulsa to Bismarck to cover developments in North and South Dakota. **Dean Wellman,** Geophysical department, has been transferred from Oklahoma City to Denver. . . . In Stanolind Oil and Gas Company's Central division, **D. D. Gillespie, Jr.,** was promoted from senior petroleum engineer to assistant division engineer at Oklahoma City. **Charles B. Snyder,** field superintendent, transferred from the Zenith to the Gorham area, Kansas. North Texas-New Mexico division changes include Ben F. Phillips, material supervisor, from the Hogback area at Farmington, N. M., to the Slaughter area at Brownfield, Texas; **Frederick W. Foell,** to Fort Worth as mechanical engineer from West Texas district office, where he was petroleum engineer; **Eugene M. Knight,** petroleum engineer, to West Texas district offices at Midland, Texas, from the Hendrick area at Wink, Texas; and **John R. Feeser,** field engineer, to Wink from Slaughter. **Harold F. Patterson** was promoted from seismograph party chief to field seismograph supervisor for Stanolind's West Texas-New Mexico division. Transfers in Stanolind's Texas-Louisiana Gulf Coast division involve **Howard M. Thompson,** drilling research engineer, from Tulsa to Houston; **Guy H. Johnston,** promoted from senior mechanical engineer, Houston, to assistant division engineer; **James L. Guy,** from architectural engineer, Houston, to senior mechanical engineer; **Jack E. Whiting,** mud engineer in the Southwest Texas district, Corpus Christi, to mud engineer in the Anse La Butte area, Lafayette, La. **Charles J. Edelen,** senior petroleum engineer, transferred from Houston to Tulsa; **Harold M. Dunson,** senior petroleum engineer, from Oklahoma City to Tulsa; **Richard A. Morse** promoted to research group supervisor at the research laboratory at Tulsa, from petroleum engineer. . . . . **John S. Kelly,** district geologist for American Republics Corporation, transferred from Wichita Falls to San Angelo, Texas. **H. D. Pennel,** geologist, from Midland, Texas, to San Angelo. **J. H. Wingfield,** landman and scout, from Wichita Falls to Houston . . . Promotions in Continental Oil Company's safety division include **Carl B. Adams,** from chief clerk to assistant to the director; **Y. K. Evans,** from shift fire marshall to safety engineer; **J. T. Steible,** from field inspector to safety engineer. . . . **H. Ben Cox,** formerly at Houston, has been named superintendent of the Land-Lease department of Cities Service Oil Company (Del.) and transferred to the Bartlesville, Okla., headquarters. . . . **Joseph M. McLaughlin,** Magnolia Petroleum Company, has been promoted from petroleum engineer in the Kermit Producing district to assistant production foreman at Kermit. **John S. Goodrich** has been promoted from assistant foreman to production foreman of the Kermit Producing district. **George C. Southerland, Jr.,** petroleum engineering assistant, has been transferred from the Lake Charles Producing district to the Kermit district. **Fred S. Wright,** who was district petroleum engineer on special assignment as chairman of the Salem field engineering committee, Salem, Ill., has been promoted to assistant division petroleum engineer of the Gulf Coast division, with headquarters at Houston. . . . **H. H. Carrick,** formerly engineer in the San Joaquin Valley division of General Petroleum Corporation's Production department, has been advanced to assistant to the division superintendent. **O. M. Hager,** formerly engineer in the Taft, Calif., field office, has been made resident engineer, East Side, Calif. **P. M. Barry,** engineer, West Side, was previously at the Taft field office. **William Alexander,** engineer in the San Joaquin Valley division, was an assistant engineer in the Bakersfield, Calif., office.



Pictured is CMC DUAL PRIME Model 39 "on the job" for Continental Pipe Line Co. Location: Ville Platte, Louisiana.

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- CMC DUAL PRIME PUMPS assure unmatched self-priming speed. Faster self-priming is the result of the exclusive CMC duel jet construction and advanced centrifugal design.
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- Maximum flexibility and versatility is a characteristic of all CMC DUAL PRIME PUMPS. Sizes available from 1½ inch to 10 inch—from capacities of 3000 to 200,000 gallons per hour.

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Our experienced pump engineers are ready at all times to advise you on "the right pump for the right job." We specialize in the manufacture of High Pressure Centrifugals, DUAL PRIME Centrifugals and Diaphragm pumps for the oil fields. For greater economy and best all around pump performance, *insist* on CMC. Write today for catalog.

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WATERLOO, IOWA, U.S.A.
The Quality Line Since 1909

R. L. Tollett was elected president of Cosden Petroleum Corporation by the board of directors meeting at Big Spring, Texas. Other officers elected are **Marvin M. Miller** and **Douglas L. Orme,** vice presidents; **A. V. Karcher,** secretary and treasurer; **Alma C. Gollnick,** assistant secretary; and **Nelson Phillips, Jr.,** assistant secretary and general counsel.

»

W. L. Stanton, formerly with Arkansas-Louisiana Gas Company, has been named petroleum engineer for The Texas Gas Transmission Corporation to head the company's new Shreveport office. For the past three years Stanton has been director of the Carthage field engineering committee with headquarters at Carthage, Texas.

»

Donald G. Clark, director of purchases of the Gulf companies since 1939, has retired. He will continue to act in an advisory capacity. The position of director of purchases has been discontinued.

Lee C. Bock, general purchasing agent for the past three years, will be in charge of purchases for all Gulf companies. Bock has been with Gulf 38 years.

John E. Lindroth

John O. Larson

John E. Lindroth, assistant secretary of Standard Oil Company (N.J.), has been appointed budget director. **C. L. Burrill,** who has been head of the Budget department, is resigning to join Creole Petroleum Corporation, a Jersey Standard affiliate.

Lindroth, who also served as secretary of the company's executive committee, is succeeded by **John O. Larson,** assistant secretary of both the company and the executive committee.

Lindroth joined the company as an office boy in 1919. In 1925, after attending evening classes at New York University, he was appointed assistant to the head of the Coordination department and was made assistant manager in 1933. He has been assistant secretary of the company since 1944.

Larson became a junior clerk with the company in 1927, while also attending evening classes at New York University. He succeeded Lindroth as assistant manager of the Coordination department in 1944, and became an assistant secretary of the company in 1945. Both men have attended advanced management courses at Harvard University Graduate School of Business Administration.

»

Don R. Ford, formerly division superintendent of the Southern division at Houston, has been appointed assistant manager of Magnolia Pipe Line Company. He has been with the company 22 years.

Don R. Ford

Ford is succeeded at Houston by **O. H. Beshell,** who has been division superintendent of the Western division at Midland, Texas.

Malcolm E. Powell has been promoted from assistant division superintendent of the Northern division at Oklahoma City to division superintendent of the Western division.

A. D. Pike, who has been assistant district superintendent for Magnolia Pipe Line at Little Rock, has been advanced to district superintendent of the Little Rock district.

»

Walter S. Browning has joined **Iley S. Browning,** independent, as geologist, and will be stationed at Henderson, Ky.

Bottom Water is a costly profit leak

Eagle Lead Wool

stops Bottom Water!

You rule out the risk of oil-wasting bottom water shutdowns when you tamp Eagle Lead Wool in the hole. This finely stranded, non-corrosive metallic wool makes a water-tight plug that seals every crack and crevice. Comes in convenient 50-pound sacks—easy to place in special cartridge-shaped Eagle Wire Containers sized to fit all casings. Order through your jobber today.

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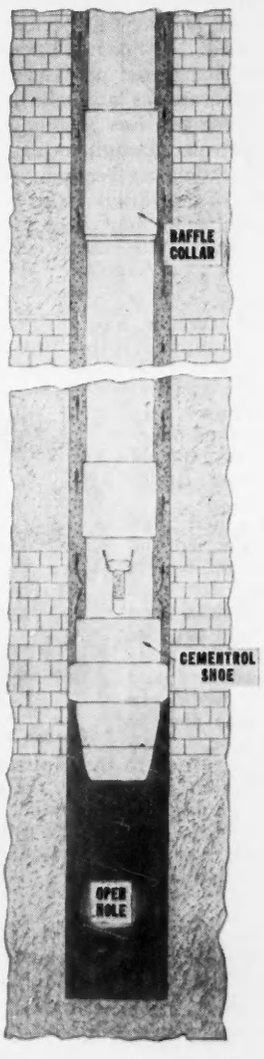
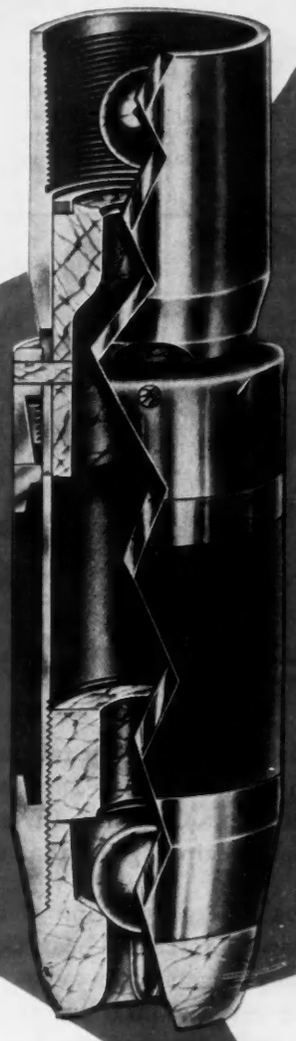
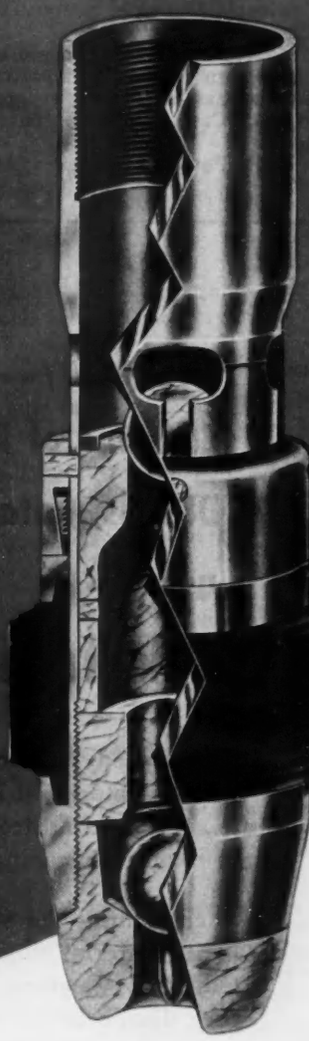
TO A SPECIFIC CEMENTING PROBLEM



Here's how CEMENTROL accomplishes its purpose



Running - in position . . . serving only as a float shoe.



Position after expansion by pump pressure.

The CEMENTROL Principal was developed to supplant conventional methods and to provide a means of overcoming well completion difficulties caused by cement intrusion into the open oil or gas bearing formation below the casing seat.

FIELD DESIGNED . . . FIELD TESTED . . . FIELD APPROVED . . . and for five years has been considered standard equipment in areas where it is imperative that exposed formations be protected from cement contamination.

Buy CEMENTROL ". . . THROUGH YOUR SUPPLY STORE"

LARKIN

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Fred H. Wilcox has been appointed coordinator of producing activities in the U. S. and Canada of the Socony-Vacuum Oil Company. He is being transferred to his new duties at 26 Broadway, New York, from the Magnolia Petroleum Company, Dallas, a Socony-Vacuum affiliate.

Robert Siegel has become manager of the foreign producing department. **F. W. Bartlett** has been made general assistant to **J. C. Case**, director in charge of producing.

F. E. Powell has been appointed deputy general manager of the Foreign Trade department, Socony-Vacuum Oil Company, Inc.

Robert Frothingham succeeds Powell as chairman of the foreign trade committee.

Charles F. Darlington has been appointed as Socony-Vacuum's representative in London. He will succeed **C. Victor Barry,** resigned.

C. T. Crawford has become assistant to the general manager and chairman of the planning group of the foreign trade department. Crawford, who is manager of the supply and distribution division, is succeeded in that post by **L. B. Davis.**

»

Philip C. Dixon, Houston, has been elected executive vice president of Midstates Oil Corporation. **George M. Vandaveer, Jr.,** and **W. H. Blackburn,** both of Tulsa, were named vice presidents. All three will have offices in Tulsa.

Philip C. Dixon

Dixon was formerly professor of petroleum engineering at Colorado School of Mines, and later was a consultant in Houston. Vandaveer, who will be in charge of production and engineering, has been with Midstates since 1940. Blackburn has been with the company since 1919.

»

Dr. Norris Johnston has been named president of the consulting firm, Petroleum Technologists, Inc., Montebello, Calif. Johnston formerly was with General Petroleum Corporation for ten years as chief physicist in charge of production research. During this period also, he was assigned to Socony-Vacuum Oil Company, Inc., to set up its production research laboratories at Dallas.

N. Van Wingen has resigned as professor of petroleum engineering, University of Oklahoma, to become vice president of the organization. Prior to joining the University he had been associated for nine years with the Richfield Oil Corporation, Los Angeles.

»

Gordon H. White has resigned from Shell Oil Company to become an independent operator. He has incorporated his company as Niles Oil Company and has established headquarters at 1406 M & W Tower Building, Dallas.

Gordon H. White

White joined Shell in 1926. He worked in surface geology in California for ten years, and was then transferred to the Texas-Gulf area to conduct surface and core-drill work. In 1938 he was sent to The Hague, Holland, and returned to the Houston office as area geologist in 1939. White was assistant exploration manager of the Texas-Gulf area, and, at the time of his resignation, was exploration manager of Shell's Midland area.

»

William A. Matthews, formerly division geophysical supervisor in the Rocky Mountain division, Stanolind Oil and Gas Company, has been named division geophysical supervisor for the company's foreign exploration division, with headquarters at Calgary, Alberta.

for Speedy . . . Low-Cost Cleaning of Rigs, Diesels, Rotary Tables use

Oakite Steam-Detergent Cleaning

FOR speedy, low-cost cleaning of rotary tables, mud hogs, crown blocks, drilling-rigs, drilling-rig Diesels, pipe lines, etc., try Oakite Steam-Detergent Cleaning. In fact try it on the toughest cleaning or paint-stripping job that comes along.

By combining the vigorous detergent action of a specialized Oakite material with mechanical force and heat, Oakite Steam-Detergent Cleaning literally blasts dirt away. Grease and muck disappear almost like magic. You'll particularly like the way you can clean hard-to-get-at recessed areas.

Oakite Booklet "How to Cut Cleaning Costs in the Petroleum Industry" contains details. Shows how to speed up and cut costs on other maintenance cleaning jobs with Oakite Steam-Detergent Cleaning. Copy mailed promptly on request. No obligation.

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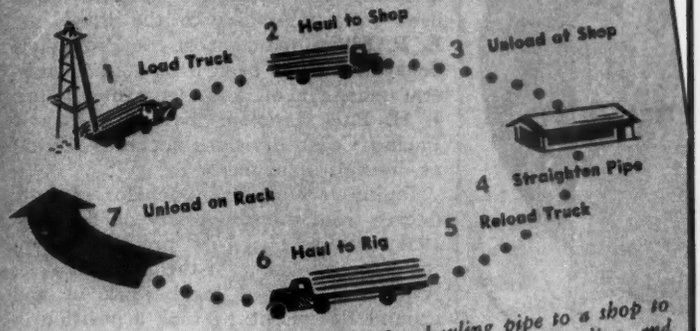
PETROLEUM SERVICE DIVISION

There are *TWO WAYS* of straightening pipe...

The costly time-wasting way...



Are you wasting time, money and labor hauling pipe to a shop to straighten it – tying up heavy trucking equipment – loading and unloading, handling and re-handling the pipe?

The quick, money-saving SHAFFER WAY!

You can make vital savings the Shaffer way – straightening the pipe RIGHT AT THE RIG! *Pipe can be checked, straightened and returned to the rack in a matter of minutes!*

HAVE YOU EVER STOPPED to check the many important savings you can make by straightening your bent or kinked pipe *at the well* with a Shaffer Portable Pipe Straightener instead of trucking it into a shop? The Shaffer Portable Pipe Straightener is a completely self-contained, heavy-duty unit that can be quickly hitched to a small pick-up and pulled to even the most remote well location. And it will easily handle any size pipe, casing, tubing, drill pipe or drill collars up to 6" in diameter! Here are just three of the multiple savings you make by having this compact, simple-to-operate unit *where* you want it, *when* you want it . . .

Savings IN TRANSPORTATION. It's simple, quick and inexpensive to tow the Shaffer Portable Pipe Straightener to the well on a regular trip when rigging-up or with a light tool-pusher's car when needed. With a Shaffer Portable Pipe Straightener on the job, there's no need to tie up a heavy, expensive truck and trailer with the time necessary to load, transport and unload the pipe at the shop . . . and load, transport and unload the pipe back at the rig!

Savings IN TIME. With this Shaffer Portable Pipe Straightener you simply roll the pipe from the rack onto the straightener, straighten it, and roll it back ready for instant use *in only a fraction of the time* necessary to load it on the truck and take it to the shop; let alone straightening time at the shop plus reloading and return trips!

Savings IN LABOR. The Shaffer Portable Pipe Straightener is completely power driven and simple to operate. You simply roll the crooked pipe onto the Straightener, apply pressure with the power-driven ram to straighten the bent portions, and roll pipe back to the rack. No specially-trained labor is needed!

FEATURES OF THE SHAFFER PORTABLE PIPE STRAIGHTENER

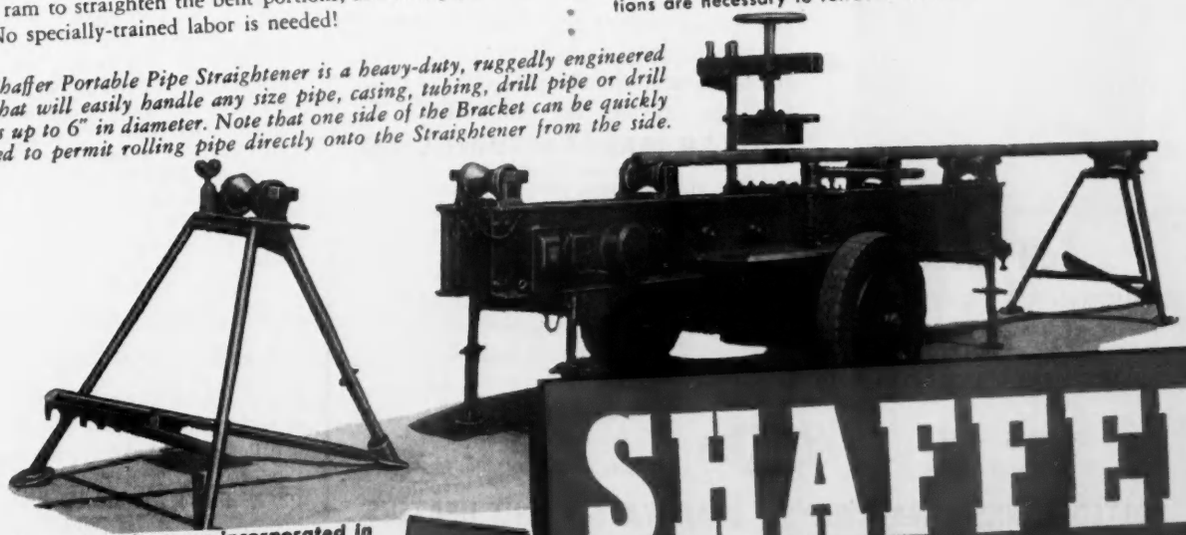
ACCURATELY ALIGNED FRAME: The rugged, non-warping frame of the Shaffer Portable Pipe Straightener consists of two 15" — 50 lb. I-beams, held in accurate alignment by two trunnion posts. The frame maintains its alignment under even the heaviest straightening loads.

FOOL-PROOF HYDRAULIC OPERATION: The pipe-straightening pressure is applied by an 8" hydraulic ram actuated by a double piston pump. Tremendous pressure is thus obtained for straightening even heavy-walled drill collars . . . yet the pressure is under constant and sensitive control of the operator at all times. Oil is used for the fluid, thus eliminating corrosion and maintenance problems. There is no loss of fluid during operations.

FULLY POWER DRIVEN: The Shaffer Portable Pipe Straightener is power-operated by a ¾ H.P. AC or DC reduction-gear motor. Or, the unit can be built with *both* AC and DC motors, if desired, to permit using either type of current. Or it can be operated by gasoline or gas engines where electricity is not available. It is adaptable to virtually *any* type of power!

AUTOMATIC RAM RETURN: Ram operation is controlled by a convenient valve and when the pressure is released, heavy coil springs automatically return the ram to its initial position. No manual or time-wasting operations are necessary to retract the ram.

The Shaffer Portable Pipe Straightener is a heavy-duty, ruggedly engineered unit that will easily handle any size pipe, casing, tubing, drill pipe or drill collars up to 6" in diameter. Note that one side of the Bracket can be quickly opened to permit rolling pipe directly onto the Straightener from the side.



There are other unique features incorporated in this unit. Contact your nearest Shaffer Representative for complete details on the many vital savings a Shaffer Portable Pipe Straightener can make for you, or write direct!

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HIGH PRESSURE DRILLING AND CONTROL EQUIPMENT • FISHING TOOLS THAT EXCEL

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OKLAHOMA CITY, OKLAHOMA, Acme Oil Tool Company, 1001 S. E. 29th Street
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Now! Butler Bolted Tanks are Painted by ELECTROSTATIC SPRAY!

New Scientific Technique Produces Amazing Results ... with Many Advantages for Oilfield Storage

HERE'S HOW IT WORKS...

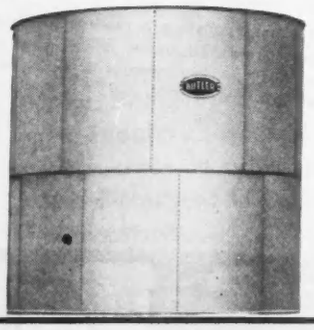
Briefly...as the atomized paint is sprayed into an electrostatic field, the particles receive a negative charge and are attracted to the positively charged tank sheets. The attraction in the coating zone is so great that some of the paint particles change and even reverse their direction, coating more than the facing surface of the articles. A uniform, long-life coating is thus assured for each sheet in Butler Bolted Tanks.

HERE'S WHAT IT DOES ...

Greater Uniformity — In electrostatic spraying, all metal surfaces attract the same amount of paint regardless of area.

Bolt Holes and Edges Completely Coated—No "missed" spots..no "Weak" spots where rust can start. The same amount of paint is attracted to bolt holes and edges as to the broad, flat surfaces of the metal sheets. These results are almost impossible to accomplish by hand spraying or dipping.

Tight, Long-Life Bond—All sheets in Butler Bolted Tanks are chemically cleaned, dried, coated with red oxide-zinc chromate rust inhibitive primer . . . then air dried before final painting. Such thorough cleaning and preparation assures a tight bond between finish and sheet that makes paint last longer, give better protection, costs you less.



Let Butler's experienced oilfield organization show you how you get maximum service with Butler Bolted Tanks. Call the one nearest you today.

BUTLER MANUFACTURING CO.

Kansas City, Mo.
Galesburg, Ill. Richmond, Calif. Minneapolis, Minn.

Call These Experts for Prompt Service

AMERICAN PIPE & SUPPLY CO.
Denver, and Rangely, Colo.
Casper, Wyo.
Cut Bank, Mont.

HARRY G. MILLER
El Dorado, Ark.

BUTLER

UNION TANK & SUPPLY CO.
Fort Worth, Houston, Odessa,
Alice, Tyler, Midland, Texas,
Lafayette and Homer, La.,
Great Bend, Kans.,
Tulsa, Oklahoma City, Okla.,
Hobbs, N. M., Jackson, Miss.

BOLTED TANKS • WALKWAYS • STAIRWAYS • UNIT HEATERS

MEN IN THE INDUSTRY NEWS

James H. Pipkin, assistant to the president of The Texas Company since 1944, has been named assistant to the chairman of the board. **J. T. Wood, Jr.**, former division manager, Pacific Coast division, Producing department, has been made assistant to the president. **E. R. Filley**, manager of the Producing department, has been promoted to general manager of that department, and **J. H. Puls**, assistant division manager, Pacific Coast division, succeeds Wood as division manager.

Pipkin received his Bachelor of Law degree from the University of Texas in 1931, was admitted to practice before the Supreme Court of the U. S. in 1938. After a period of legal work in and around Beaumont, he took a position in The Texas Company's Legal department at Houston in 1934. He was made assistant to the executive vice president and transferred to New York in February, 1942, and two years later became assistant to the president.

Wood was graduated from Stanford University in 1918 after service in World War I. He was first employed by The Texas Company in 1929 as a district geologist in the San Joaquin Valley, California. In 1930 he was made assistant chief geologist with headquarters at Los Angeles, and in July, 1931, became chief of the Lands and Leases division. In April, 1938, he was appointed assistant manager and, in July of that year, division manager of the Pacific Coast division.

Filley is a graduate of Baker University, Baldwin, Kansas. He entered the service of the Producers Oil Company, a Texaco subsidiary, in 1914. He was made chief clerk of the Land department in February, 1917, and two years later became secretary to the general superintendent, Oklahoma-Kansas division, Producing department. In June, 1926, he was made division superintendent, Oklahoma-Kansas division, and in January, 1929, was named assistant division manager, and subsequently, division manager. He became assistant manager of the department at Houston in March, 1938, and became manager in April, 1947.

Puls was graduated from California Institute of Technology in 1923, and entered the service of the California Petroleum Company, later The Texas Company (California), in 1925. He worked as a design engineer and chief draftsman in the Refining department, and in 1937, was transferred to the Producing department as a mechanical engineer. Later he held the posts of chief engineer and superintendent of drilling and production. In October, 1946, he was named assistant division manager, Producing department, Pacific Coast division.

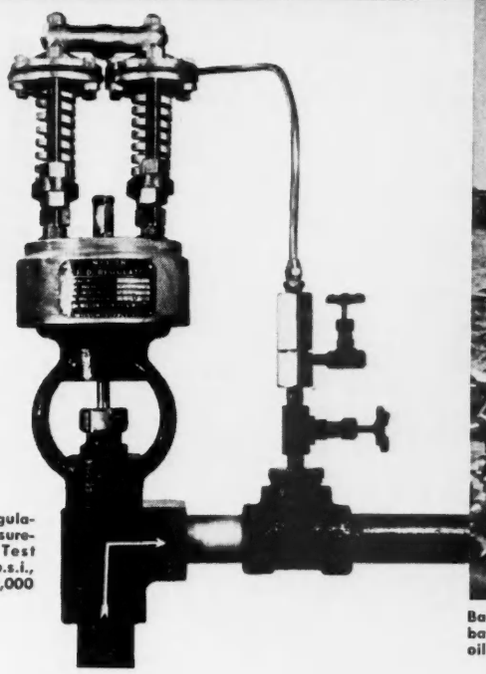
»

Neal B. Prichard has been elected a director of Anderson-Prichard Oil Corporation, Oklahoma City, to succeed his uncle, the late **L. H. Prichard**, one of the company founders.

»

Thomas K. Hendrick has joined the geological staff of Kingwood Oil Company at Oklahoma City.

Nixon "S.F.D." Regulator Guards the Oil Fields



Nixon "S.F.D." Regulator used as a pressure-reducing valve. Test pressure 10,000 p.s.i., working pressure 5,000 p.s.i.

Battery of four Nixon "S.F.D." Regulators used as back-pressure valves for pressure control on oil/gas separators on a group of Texas wells.

Courtesy: Wilson Foundry & Machinery Co., Houston, Texas.

And its vital parts are made of

NEOPRENE!

Fully deserving its reputation as sentinel of the oil fields, the Nixon "Selective Flow Differential" Regulator is constantly depended on to perform a four-fold job of protection. It is entrusted with responsibility for well-head pressure reduction and gas-line pressure maintenance, as a well purger to prolong flowing life of wells, and to eliminate expensive swabbing jobs, as a jet collar controller to increase production on wells with reduced gas-liquid ratios, and as a back-pressure regulator. The Nixon Regulator handles working pressure up to 5,000 p.s.i. And because it must handle well-fluids laden with sand-grit, chemicals, acids and other destructive agents . . . must be always on the job in perfect working order . . . engineers specified neoprene for its most vital parts.

Main control diaphragm, escape valve seat, and two pilot control diaphragm gaskets—every vulnerable internal part requiring flexibility or resiliency—are made of neoprene. Neoprene's inherent resistance to deterioration from oils, chemicals, pressure, heat, abrasion and flexing make it outstanding for such applications where constant operating efficiency is of the utmost importance.

If you have a problem involving a resilient material to meet any requirement, check the many advantages of Du Pont neoprene. Ask your nearest rubber manufacturer or write direct for full information.

E. I. du Pont de Nemours & Co. (Inc.)
Rubber Chemicals Division K-9
Wilmington 98, Delaware

FREE! The Neoprene Notebook. *Interesting stories . . . new, unusual applications of neoprene. Write . . . E. I. du Pont de Nemours & Co. (Inc.), Rubber Chemicals Division K-9, Wilmington 98, Delaware.*

HERE'S WHY NEOPRENE DOES SO MANY JOBS SO WELL!

- ★ High tensile strength, resilience, low permanent distortion.
- ★ Tough and durable, resists abrasion and cutting.
- ★ Superior resistance to sunlight, aging, ozone, and heat.
- ★ Resistance to deterioration by oils, solvents, chemicals, acids.
- ★ Superior air-retention, low permeability to gases and fluids.
- ★ Special compositions are flame-retarding, static-conducting, flexible at low temperatures.

FOR BETTER EQUIPMENT, SPECIFY

NEOPRENE

The rubber made by Du Pont

DU PONT

REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

DEATHS

Charles Hosmer Morse III, 52, vice president in charge of manufacturing, Fairbanks, Morse & Company, died July 9. Morse, eldest son of Col. Robert H. Morse, president of the company, had been with the firm since 1919. At one time assistant general manager of the Beloit works, he also served as president of the Inland Utilities Company, a Fairbanks-Morse affiliate.

C. H. Morse III

W. W. Ince, 41, died July 28 in Montgomery, Ala. He had been with The Texas Company for 15 years and had been state manager in Oklahoma. Two years ago he was transferred to Dallas as assistant division manager and last July was transferred to the company's offices in Atlanta.

George J. Collins, 51, independent oil operator, died July 30 in Tulsa. He served as a facilities specialist with PAW during World War II.

A. M. Foute, 62, of Mission Manufacturing Company, Houston, died June 29 in Houston. Foute was secretary of Mission at the time of its incorporation in December, 1925, and had been connected with the company since.

Edward J. Burnell, 61, vice president and general sales manager, and director of Link-Belt Company, died at Winnetka, Ill., July 22. A graduate of Lehigh University, Burnell had served Link-Belt Company in engineering, sales and plant management capacities.

E. J. Burnell

Lloyd C. DeHarte, for 23 years an employe of The Hancock Oil Company of California, died in July. Before his retirement, he had been pipe line superintendent for the company.

Edwin H. Hunt, 52, manager of the Calgary division of McColl-Frontenac Oil Company, died July 24. He was a director of the Western Canada Petroleum Association.

James M. Davidson, superintendent of the Buffalo plant of Farrel-Birmingham Company, died July 15.

Norris T. Gilbert, 69, executive vice president and former general manager of Midstates Oil Corporation, died July 28 in Tulsa. He was treasurer of the IPAA for 14 years and had been a member of that organization since 1930.

Thomas P. Lyon, 76, former assistant treasurer of Cities Service Company, died July 26 at Long Beach, Calif. He served with Denver Gas & Electric Company and other Cities Service affiliates prior to his transfer to New York in 1912. He was appointed assistant treasurer in 1923, and served in that capacity until his retirement in 1947.

William M. Metzler, 89, consulting superintendent of mechanical goods division for the Goodyear Tire & Rubber Company, died in Akron July 23. Metzler completed 63 years in the rubber industry on February 1.

Clyde I. Layton, 60, independent oil operator and former general superintendent for Tidal Oil Company in Tulsa, died August 1 at Independence, Kansas.

Alex C. Clark, 48, oil field trucking firm operator, formerly with Oil Well Supply Company, died August 3 in Tulsa.

J. Elmer Thomas, 57, Texas oil man and geologist, died August 20 in Fort Worth. Thomas was an independent operator and consulting petroleum economist in Fort Worth and Houston, and had served with government agencies in the U. S. and abroad. Author of numerous publications, Thomas made several trips to South America as a representative of WORLD OIL, and wrote a series of articles on South American petroleum economics.

Acme
Cable Tools
TRUSTWORTHY SINCE 1900
Figured by the Foot of Hole Drilled... Acme's Cost Less
And that makes our Rein Type Welded Jars your more profitable, trustworthy buy . . .
Why so: Acme's Jar and Capping Steel specifications are so very rigid—allowing only a 5-point range (never the mills' usual 10) that we pay EXTRA. Premium grade steel, therefore, assures you greater protection—down hole.
Every forging's uniformity electrically CONTROLLED . . . automatically shutting-off at EXACT proven CORRECT point. No "burning" possible . . . Such vigilance is an Acme MUST —from engineering to final inspection.
Yes, it's their EXTRA inner-qualities . . . born of a 49-years specialized experience backlog, and carried on by "Old School" Jar-makers, who strive for minute detail perfection . . . that make Acme Jars a "preference" tool, based on hole-footage cost.
Fig. 107 Acme Rein Type Welded Jar
More of EVERYTHING You Need in an Acme String . . .
A
B
C
D
E
F
A—Wire Line Clamp, 12"
B—Prosser Swivel Socket
C—Drilling Jar
D—Drilling Stem
E—Bailer
F—Drilling Bit
See Acme's latest Catalog and Manual in Composite Catalog (Vol. 1). Or mail penny postal TODAY for your copy . . . chock-full of valuable information for every Cable Driller.
See other Acme Drilling Tools in panel (right) . . . for more of EVERYTHING you need in a Trustworthy String.
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ACME DRILLING & FISHING TOOLS
Since 1900

Partial Shipments Only...

Every shipment that leaves the Twin Disc Factory is incomplete . . . only because the *service* that goes with each sale is delivered later . . . whenever and wherever it may be needed.

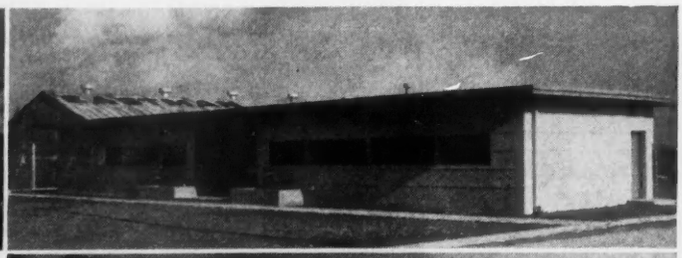
Twin Disc maintains five factory branches and 47 Parts Stations, strategically located throughout the country, to provide speedy and efficient service.

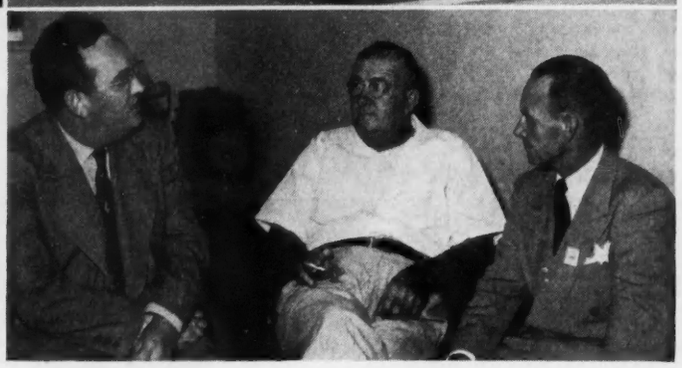
It is this policy of complete follow-up service that has given Twin Disc products the broad acceptance they enjoy among leading equipment manufacturers. Specify Twin Disc on your next power application.

TWIN DISC CLUTCH COMPANY
Racine, Wisconsin
(Hydraulic Division, Rockford, Illinois)

SPECIALISTS IN INDUSTRIAL CLUTCHES SINCE 1918

EQUIPMENT AND SERVICE SUPPLIERS' NOTES





EASTMAN OFFICES OPEN—These are new plants of Eastman Oil Well Survey Company. The Ventura, Calif., district office, above left, is at 1190 North Ventura Avenue, two blocks from Eastman's former location. Part of the three-building Gulf Coast division office is shown above, right. The Houston plant is at 2100 Old Spanish Trail.

Present at the opening of the Houston office were, lower right photo, Gordon Jackson, vice president and general manager of Eastman Oil Well Survey Company; Albert Shaw, drilling superintendent, Magnolia Petroleum Company; and William G. James, Eastman's Gulf Coast manager.

Eastman Oil Well Survey Opens New Houston and Ventura Offices

Formal openings of the new Gulf Coast division office at Houston and the Ventura, Calif., district office of Eastman Oil Well Survey Company were observed by open houses for oil industry officials.

The Houston plant at 2100 Old Spanish Trail, consists of three buildings a whipstock rack, and large parking area. The office building has a 90-foot frontage and contains general office, reception lobby, four private offices, conference and drafting rooms.

Welding, machine and instrument shops are in a 40 x 100-foot pre-fabricated steel building, which also houses the warehouse section. A five-car garage for company cars is also located on the property.

Branch offices at Brookhaven, Miss.; Houma, Lafayette and New Orleans, La.; Victoria, Longview and Alice, Texas, are under the jurisdiction of the Houston office, which is directed by William G. James, Gulf Coast division manager and a vice president of the company.

More than 800 oil industry guests attended the opening of Eastman's $100,000 Ventura quarters. The one-story white stucco office building contains a private office, general office, and large drafting room. Attached to the office structure is the warehouse, of aluminum sheeting on steel frame. Facilities also include a paved parking area, with car wash racks and a whipstock rack.

Darrell Raysor has been district manager of the Ventura office since 1942. For six previous years he had worked out of the Eastman Long Beach division office, which is managed by Ross E. Wiley.

Gordon Jackson, vice president and general manager, and Bud Hilker, director of public relations for Eastman, attended both openings.

Stoody Names Distributors

Stoody Company, Whittier, Calif., has appointed Morris, Wheeler Company, Philadelphia, its distributor for eastern Pennsylvania, New Jersey, Delaware and Maryland. Silver Welding Supply Company, Boston, will handle Stoody products in eastern Massachusetts.

BOOM THOSE LOADS *safer-easier* with Coffing SAFETY LOAD BINDERS

safer Because of the ratchet lever action the handle will not fly when the load is released. Shifts in loads can be adjusted by merely operating the handle. You do not need to release load to get another grab on the chain. Coffing Safety Load Binders are factory tested at 100% overload.

easier Because Coffing Safety Load Binders are light weight (Model A—11½ lbs., Model F—24 lbs.), have big capacities (3000 lbs. and 6000 lbs.) and a long lift of two feet on each model, load can be adjusted to within a fraction of an inch.

For complete information on these safe, easy-to-use load binders, write Dept. 09LB.

COFFING

COFFING HOIST CO., Danville, Illinois

Quik-Lift Electric Hoists • Hoist-Jacks • Migbty-Midget Pullers • Spur Geared Hoists • Differential Chain Hoists

SAFETY-PULL HOISTS FOR ALL PULLING AND LIFTING

Lifting pipe line, pulling rod lines, raising suction hose in drilling, bending pipe line—for these and many other lifting and pulling jobs, use a Safety-Pull Ratchet Hoist. The ¾ ton model weighs but 14 lb.—eight other models handling up to 15 tons.

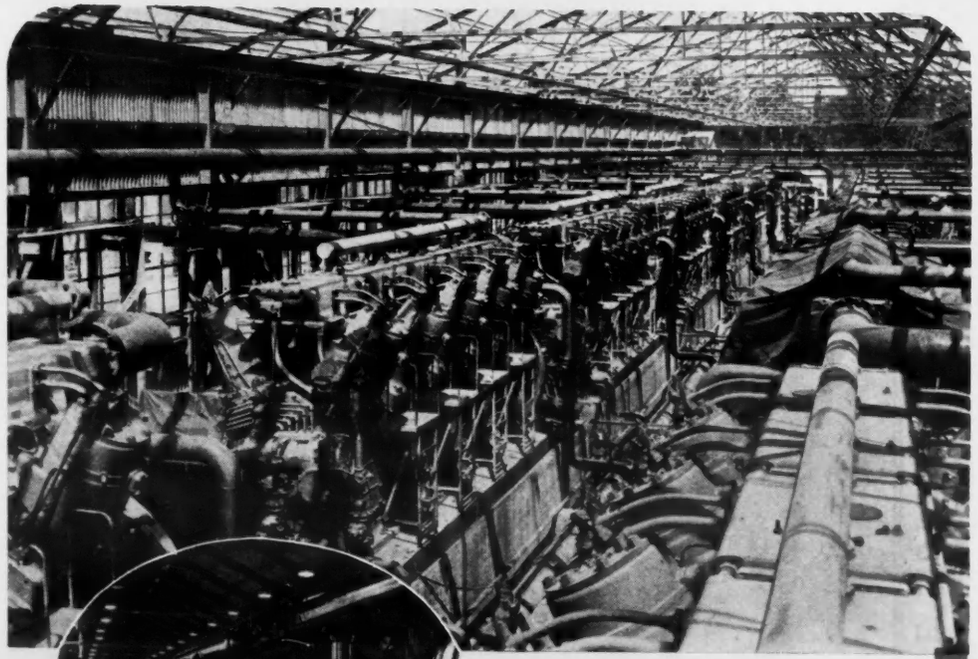
GMV Turboflow Saves Fuel For Big And Little Big Inch

As indicated on this map of the Inch line, 5 of the 7 new stations powered by reciprocating engine-driven compressors are GMV-equipped — a total of 46,900 Cooper-Bessemer V-angle hp.

Of particular significance, the GMVs most recently furnished (29 of the 44 now on the lines) are *Turboflows* — Cooper-Bessemer's latest gas-engine development, affording a full 10% increase in power output while reducing fuel consumption by at least 15%.

Today, more and more of the big gas lines are taking advantage of the new savings made possible by Cooper-Bessemer V-angle Turboflows. Unprecedented fuel economy and increased power output, obviously means big reductions in the overall costs of installation.

If your plans call for compressor horsepower, you'll find Cooper-Bessemer Turboflows to be your best bet on *every* score.



- **Overhead view of 14 Cooper-Bessemer GMVs during installation at Texas Eastern's Bald Knob, Arkansas, station. Total: 15,400 hp.**
- **GMV 10-cylinder compressors in Texas Eastern Transmission Corporation's Hope, Arkansas, station . . . 8,300 efficient horsepower.**

Another Example of Efficient Power at Lower Cost

ANGLE

Compressors by Cooper-Bessemer

MOUNT VERNON, OHIO AND GROVE CITY, PENNA.

New York Washington Bradford, Pa. Parkersburg, W. Va. San Francisco, Cal. Seattle, Wash. Houston, Dallas, Greggton, Pampa and Odessa, Texas Tulsa Shreveport St. Louis Los Angeles

PARAFFIN'S NO PROBLEM

when your sucker rods are equipped with

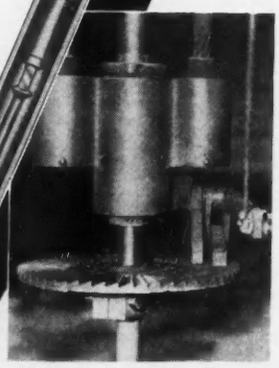
HUBER SCRAPERS

Paraffin can't accumulate in the tubing when your sucker rods are equipped with Huber Scrapers. NO PARAFFIN . . . NO TROUBLE . . . NO REMOVAL COSTS!

Huber Scrapers, shrink-fitted to new or used sucker rods, scrape paraffin from the tubing wall as the string rotates and reciprocates. This constant scraping prevents paraffin accumulation . . . eliminates paraffin removal.

Huber Scrapers quickly pay for themselves. Wells requiring paraffin removal every week or ten days have been on production for months without paraffin trouble after Huber Scrapers were installed.

If paraffin's a problem, install Huber Scrapers. Write for descriptive bulletin.



HUBER ROTATING ROD HANGER

This rod hanger rotates the rod string a fraction of a turn on each reciprocation. The horizontal teeth on the turn table are engaged by two ratchet levers which are actuated by a flexible steel cable attached to the walking beam. On each reciprocation the levers move the rod string a fraction of a turn.

SOLD THROUGH SUPPLY STORES

J. M. HUBER CORPORATION
P. O. BOX 831 BORGER, TEXAS

HUBER
PARAFFIN SCRAPERS
SCRAPE AS THEY ROTATE AS THEY RECIPROCATE

HEADED FOR CANADA—Four new Dowell Incorporated units take the "roll" signal from the lead driver and start the 2300-mile trip from the Tulsa plant to Calgary, Alberta, Canada. The units consisted of two Electric Pilots, an acidizing pump truck and trailer and a gun carrier for Perfo-Jet. The Electric Pilot units will make Dowell Electric Pilot services available in Canada for the first time. C. W. Mossey and Wilbur N. Helberg, of the Tulsa offices, are in charge of the caravan. Floyd Carr, also of Tulsa, will meet the units in Calgary. Carr is Perfo-Jet development engineer.

Sales Engineer Joins Staff of Plastic Coating Corporation

Sidney Val Smith, a graduate of Texas A & M College, has been added to the sales engineering staff of Plastic Coating Corporation, Houston. Smith served formerly in sales engineering capacity with Minnesota Mining and Manufacturing Company and with Stewart and Stevenson Services, Inc. With Plastic Coating, Smith will spend much of his time in the field surveying and supervising the application of plastic coating to oil field equipment and marine vessels.

Sidney Val Smith

Schlumberger Announces Canadian And Mid-Continent Appointments

R. Legeron has been transferred from the Houston headquarters of Schlumberger Well Surveying Corporation to the Canada division, where he will serve as manager. C. W. Bailey, former Schlumberger manager in Canada, has been moved back to the company's operations in the U. S. B. L. Delleney will continue as assistant manager in the Canada area.

Schlumberger also announced the appointment of R. D. Ford as manager of the Mid-Continent area with headquarters at Tulsa. He succeeds R. G. Hamilton who has resigned to do independent consulting work. C. K. Ruddick is assistant manager of the Mid-Continent area.

PROOF - *not Guesswork*

Makes FWD America's Foremost Heavy-Duty Truck

To prove efficiency and economy
FWD high-balls over hilly, curved road
To prove ability to get through
FWD slogs through bumper-high mud and clay
To prove FWDs withstand distortion
FWD twists over diagonal ditches 18 inches deep
To prove safety on curves
FWD circles 100-foot unbanked course at high speed
To prove hill-climbing ability
FWD climbs 70% plank-covered grade
from dead stop
To prove advantage of four driving wheels
FWD drives through 3 feet of sand . . up 6% slope
To prove tractive ability
FWD's powered front wheels climb 8-inch beam
To prove efficiency of auxiliary equipment
FWD drills pole holes in earth-boring area
To prove power and traction
FWD speeds safely on straightaway and curves

AN INVITATION TO TRUCK BUYERS

We invite you to watch FWDs pass a series of the most rigid performance tests. Ask your FWD distributor to arrange for you to visit our plant. Or — if you can't get away, ask him to show you the movie, *The FWD Story*. In either case, you will see for yourself how FWD trucks can help solve your heavy-duty trucking problems.

Walter A. Olen
President
The Four Wheel
Drive Auto Co.

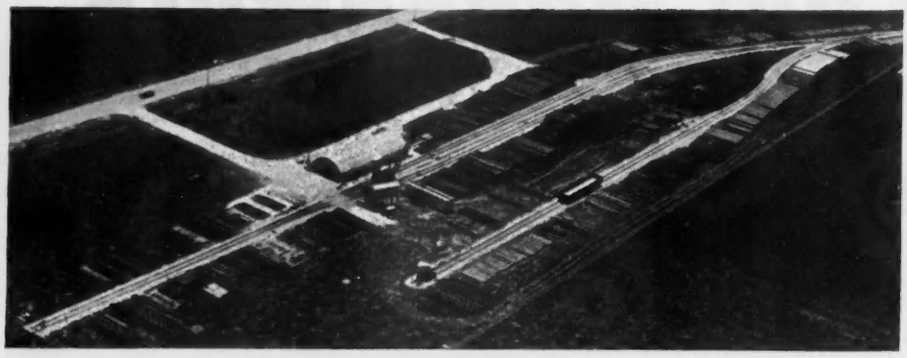
YOU want to know that your truck can climb steep grades . . . drive through deep snow, mud or sand . . . get you through to off-the-road locations. You want to know it can speed heavy loads safely over slippery highways . . . that it can get you around sharp curves without skidding. You want to know your truck has the stamina to insure long life . . . that it will do it without expensive mechanical breakdowns.

You can be sure it will if it's an FWD! What's more, with FWDs, you can be sure of these advantages — *even before you buy.* And here's why. On FWD's proving ground, you get proof — *not guesswork* — of what an FWD will do for you. A series of scientifically designed torture tests duplicates every operating condition you're liable to meet. Yes . . . FWDs prove themselves thoroughly.

Find out what this can mean to you. See your FWD distributor — or write direct for complete facts about FWD Trucks.

THE FOUR WHEEL DRIVE AUTO COMPANY
Clintonville, Wisconsin
Canadian Factory: Kitchener, Ontario
FOUR AND SIX WHEEL DRIVE TRUCKS

America's Foremost Heavy-Duty Truck



FOSTER OPENS PLANT—The L. B. Foster Company has opened its new $150,000 Houston plant, the company's first in the Southwest district of 12 states. The plant has complete facilities to handle steel rails and steel products on its 12-acre site in the Burchfield industrial district of Houston. Transportation facilities for the warehouse include a spur line from the Southern Pacific Railroad and a fleet of trucks. Jerome B. Strauss is manager of the Southwest division.

30 YEARS Experience...
HELPS SOLVE YOUR HOUSING NEEDS

MANUFACTURERS OF SPECIAL MILLWORK: DISTRIBUTORS OF JOHNS-MANVILLE BUILDING MATERIALS: CURTIS WOODWORK

Write for Information

It takes experience to produce the best, most practical prefabricated houses for the oil industry. That's why STURDY-BILT Houses, which have been manufactured for 30 years, are your best bet for all types of oil field housing. Southern Mill *knows* the types and quality buildings you need. Long years of experience also enables the company to transport and erect your oil field camp quickly and efficiently.

STURDYBILT
SOUTHERN MILL & MANUFACTURING CO.
Tulsa, Oklahoma
Prefabricated, Demountable Houses

STURDYBILT HOUSES COMPLY WITH COMMERCIAL STANDARD CS125-45 OF THE NATIONAL BUREAU OF STANDARDS FOR PREFABRICATED HOMES

Sales Representative Is Named For Cameron Commercial Forging

Clyde W. Davis, former supervisor of products control, has been named general sales representative for the newly created commercial forging division of Cameron Iron Works, Houston.

Clyde W. Davis

D. E. Wilson, chief metallurgist, will work closely with the commercial forging division as a consultant with manufacturers. Prior to joining the Cameron organization two years ago, Wilson was works manager with the Portland Forge and Foundry Company, chief metallurgist for the Studebaker Automotive Company aviation division, and chief metallurgist for the Edwards Valve and Manufacturing Company.

Spartan Tool and Service Offers Rector "Fulbore" Cement Head

Spartan Tool and Service Company, Houston, now stocks the Rector "Fulbore" cement head, according to Frank Champion, president. The cement head assures a closed circuit for the elimination of air and provides positive shutin control, he stated. All Spartan cement camps will have the new equipment for use with the conventional method, whether the one or two plug type, and also the Rector "Fulbore" method.

The cement head has three cement inlets which permit pumping in maximum volumes of cement. Full casing discharge is provided by the float shoe. When the float assembly has been ejected from the shoe, the discharge area through the shoe is the same as that of the casing. Positive latching of the back pressure valve in the stall collar prevents back flow of cement eliminating the necessity of holding pressure on casing.

Edward Valves Official Retires

Ralph H. Heberling, vice president in charge of manufacturing of Edward Valves, Inc., East Chicago, Ind., since 1944, has retired. Heberling joined the company March, 1942, as assistant to the president. He was formerly a Chicago area manufacturer and a consulting industrial engineer with Business Research Corporation.

Standardize on Standard

9 BIG STORES
CONVENIENTLY LOCATED

STANDARD pioneered in servicing the oil industry in the Gulf Coast. 9 big stores, completely stocked with the finest drilling and production equipment, are strategically located with respect to the active fields in this area . . .

Now comes the development of "off shore" Marine Drilling and you will find STANDARD on the ground, offering the same service that has earned the good will of operators throughout the entire Gulf Coast territory . . .

Houston has been selected as the location of our 9th branch store. Here you will find the most complete stock of drilling and production equipment and here you will receive the same co-operation and assistance in your production problems that have always characterized STANDARD service.

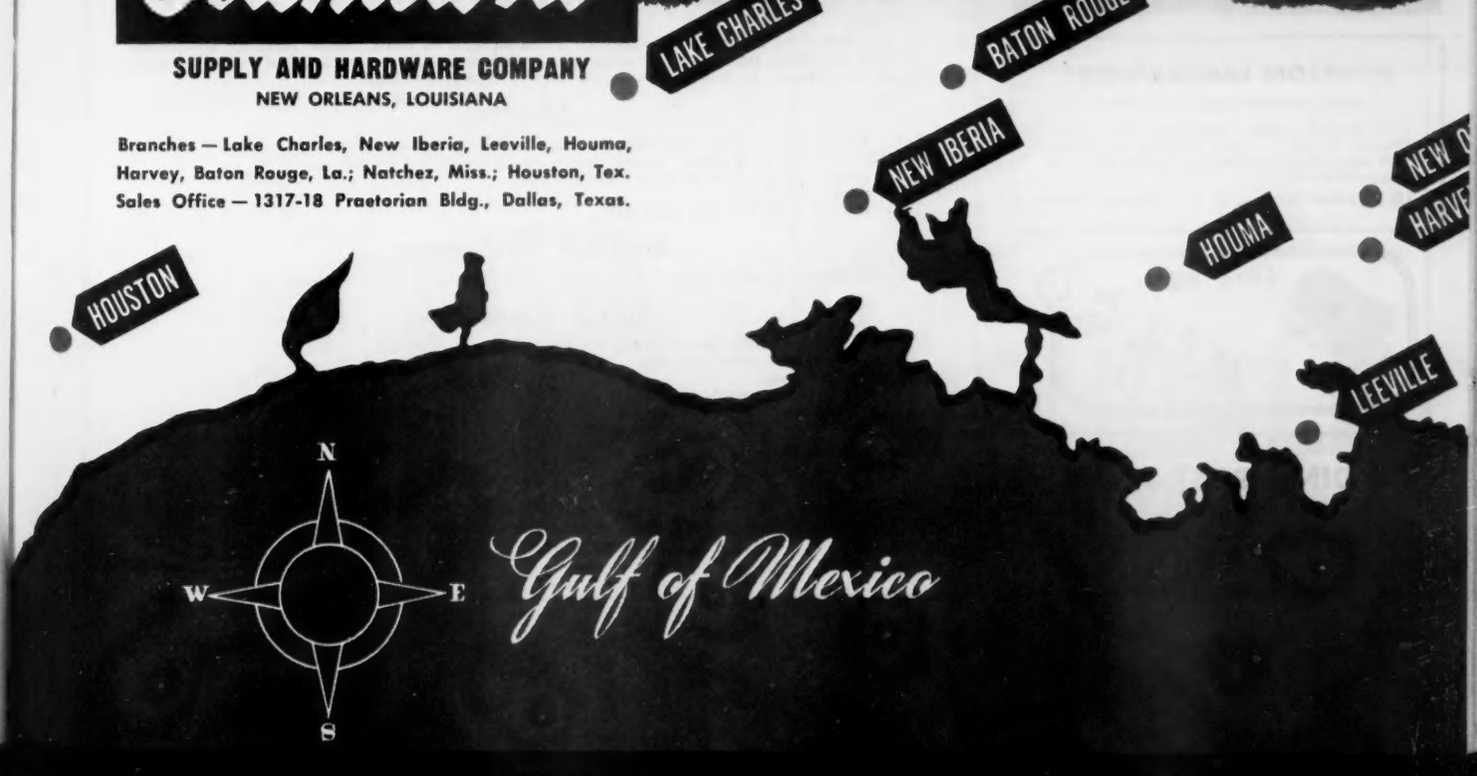
DISTRIBUTING THE PRODUCTS OF THESE LEADING MANUFACTURERS:

National Tube Co.
Republic Steel Corp.
Hughes Tool Co.
Reed Roller Bit Co.
Cameron Iron Works
Wickwire Spencer Steel Co.
Whitlock Cordage Co.
The Lunkenheimer Co.
Edward Valve & Mfg. Co.
Hewitt Rubber Corp.
Mission Mfg. Co.
Stockham Valves & Fittings, Inc.
Web Wilson Oil Tools
Link-Belt Co.
Nordstrom Valve Co.
National Transit Pump & Machine Co.
Taylor Forge & Pipe Works
Phelan Faust Paint Co.
Rust-Oleum, Corp.
Hancock Valves
Ashcroft Gauges
Gates Rubber Co.
Worthington Pump & Machinery Co.
and others

Standard

SUPPLY AND HARDWARE COMPANY
NEW ORLEANS, LOUISIANA

Branches — Lake Charles, New Iberia, Leeville, Houma, Harvey, Baton Rouge, La.; Natchez, Miss.; Houston, Tex.
Sales Office — 1317-18 Praetorian Bldg., Dallas, Texas.



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SHREVEPORT, LOUISIANA

CHARGES FLOWN TO VENEZUELA—Reflecting Venezuela's fast-moving pace in oil field activity, 30,000 Koneshot charges were flown to that country to meet the perforating needs of the local oil industry. The shaped charges will be used in Koneshot guns by Petro-Tech, Venezuelan affiliate of Lane-Wells Company, suppliers of technical oil field services.

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STANDCO BRAKE LINING

For the easiest brake known. It feeds off evenly. Standco never scores brake rims. See Pages 3608-3613 Composite Catalog.

Standco Brake Lining Co.
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HOUSTON LABORATORIES

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Podbielniak Gas Analyses, Oil Field Brines, Waters, Cores, Muds, etc. Reservoir equilibria studies for crude and condensate wells.

LD 267—Box 132 Houston, Texas

TRADING POST AHEAD

PAGE 300

Export and Domestic Personnel Changes Announced by Lane-Wells

Robert Hall, formerly office sales engineer in the Los Angeles export office of Lane-Wells Company was transferred to Petro-Tech, Venezuelan subsidiary of the company. Hall's transfer was made to effect closer liaison between the home office and Petro-Tech, and to expedite the shipping of U. S.-made Lane-Wells products to users in Venezuela.

Hall joined Lane-Wells more than three years ago after serving more than three years with the Army Air Forces during World War II. He attended the University of Southern California and the University of California at Los Angeles, majoring in foreign trade.

William Harris replaces Hall in the Los Angeles export office as office sales engineer. Harris joined Lane-Wells more than two years ago as a statistical aide. He is a graduate of St. John's College at Annapolis, Md.

Fred Plumlee, formerly gun perforator operator at Lane-Wells' Cisco, Texas, truck station was promoted to station superintendent. Plumlee has been with Lane-Wells since October, 1944, when he joined the firm as a rigman. He was promoted to gun perforator operator on March 1, 1946.

Courtney J. Ritchey, who has been handling operations in the Cisco area in addition to sales engineering, will now devote his full time to sales engineering activities in that locality.

FOR SALE

OFFSHORE SEISMOGRAPH FLEET

Bids are invited for the following equipment which includes all boats, Shoran surveying equipment, and radio equipment required for offshore seismic exploration. At present based at Freeport, Texas, and can be inspected by appointment. Write box No. 99-WO, World Oil.

BOATS

2—62'-4" Diesel twin screw steel recording boats built to order by Higgins
2—45'-9½" Diesel twin screw "Eureka" boats for Shoran base stations
1—37' gasoline single screw wooden "Eureka" boat
1—45' steel utility barge
1—16' Higgins skiff with outboard motor

SHORAN EQUIPMENT

Complete Shoran surveying equipment for three mobile stations and three base stations

RADIO EQUIPMENT

7—Kaar series 46Y radio transmitters (50 watt)
7—Kaar series 25EY radio receivers
6—Premax antennas
4—Kaar 642A power supply (110 v AC)
5—Kaar D24Y direction finder receivers
1—Set Halliburton wire line surveying equipment
Miscellaneous radio and Shoran test equipment

—ALSO—

1—110' converted Sub-chaser Diesel twin screw wooden recording boat complete with necessary radio equipment at present based at Morgan City, Louisiana.

Write: Box 99-WO, c/o World Oil, Houston 1, Texas

Fly KLM to the Oil Centers of the World

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ARUBA, CURACAO
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BARCELONA (PUERTO LA CRUZ)

FROM NEW YORK TO

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KLM's 75,000-mile Royal Route is particularly popular with executives and engineers whose business takes them to the oil centers of the world. Daily *Constellation* flights from New York and Miami.

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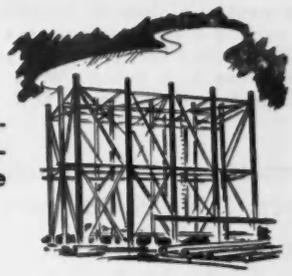
The Story of AVONDALE and the OIL BUSINESS



Giant STEEL platforms built for offshore drilling. Write for details.

From WAR to OIL... Conversions of all types and sizes of craft.

Personnel and service launches built of STEEL! Speedy, efficient, rugged.

Towboats built and repaired. Marine work is our specialty.

AVONDALE
MARINE WAYS, Inc.

Main Plant: Avondale, La. *Quick Repair Plant: Harvey, La.*

MAIL: WESTWEGO, LA.

SALES MANAGERS CONFER—Company officials and district sales manager of Jones & Laughlin Supply Company attended a three-day meeting in Tulsa to discuss new equipment and recent improvements in other product lines being stocked. Left to right, standing, are A. G. Chamberlain, L. R. Roberts, W. O. Hardy, D. T. Ottinger, J. K. Guinn, H. L. Wilkins, H. U. Everett, D. E. McCormick, H. J. McAdams, H. D. Stanley, H. H. Brown, W. R. Clarke, U. G. White, Jr., R. E. Howe, F. J. Kopp, M. L. Eubank, J. K. Lytle; seated, middle row, R. W. Woods, Jr., H. E. Wagner, A. G. Bastain, Rainey Elliott, H. H. Wilson, President J. L. Shakely, Robert McCoy, Jr., E. B. Thornburg, G. B. Chapman, M. A. Park, J. A. Evans, Jr.; bottom row, F. L. McFarland, Doyne Carson, W. L. Vinson, A. A. Hopper, J. W. Kaye.

Hercules Supply Incorporates, Selects Two Vice Presidents

Hercules Supply Company, after almost 30 years, has become a corporation, and has added J. W. Elizardi, Jr., and J. E. Finch as part owners, officers and directors. John T. McCarthy, Jr., founder, is president of the corporation.

Elizardi, a vice president of Hercules, was formerly a vice president of the Griscom-Russell Company. Finch, vice president in charge of industrial supply sales, was a vice president of Plowden Supply Company.

The Hercules warehouse and headquarters are at 6900 Clinton Drive, Houston.

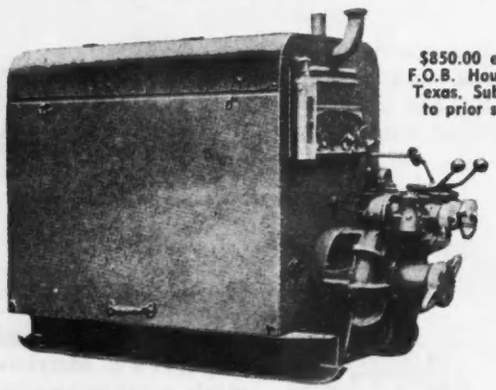
Offices Moved

The Dallas offices of Stewart & Stevenson Services, Inc., have been moved to 1426 North Industrial Boulevard.

FIRE PROTECTION!

Jetting—Transfer Work—Irrigation

We offer NEW surplus CHRYSLER-HALE Centrifugal Pumpers at approximately 50% of original purchase price.



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PUMP DATA	ENGINE DATA
Hale Model OCD 1001	Chrysler T-118 (Ind. 7)
500 GPM—150 PSI—346 Ft. Hd.	6 Cylinder
HALE Ejector Priming	3-7/16" x 4¼" B & S
4" Suction — 2½" Discharges N.S. Threads	236 Cu. Inches Displ.
Compact — Efficient	Radiator
Quick opening valve on each discharge	Starting Equipment
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Oil: Titan of the Southwest

By CARL COKE RISTER

This book, the fruit of three years of steady research and writing, is the story of the discovery and production of oil in the "Great Pool"—from the days of the so-called oil springs, through Spindletop, Glenn Pool, Mexia, Oklahoma, East Texas and other strikes. It is an absorbing account of the men who have produced the prime resource of an industrial civilization, written by a distinguished historian of the Southwest.

A significant and important contribution, which will be of great value and interest to everyone, from the prospector, investor, and tool pusher, to the average American who has hardly been aware of the enormous transformation which has carried the United States into the "age of oil."

CHAPTER HEADINGS:

Texas' Oil—Spring Era
The Red Man's Hidden Wealth
From Paola to Neodesha, Kansas
Corsicana, the Curtain Raiser
Queen of the Neches
Exploiting Other Salt Domes
Red Fork, Cleveland, and Glenn Pool
Louisiana in the News
Exploring the Red River Uplift
Oklahoma Steals the Show
The Ranger Oil Boom
Desdemona and Breckenridge
Along the Mexia Fault Zone
Competition in Oil
An Osage Monte Carlo
Arkansas' El Dorado
Texas Forges Ahead
Greater Seminole
Oklahoma City's Bonanza Field
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An Era of Specialization
The Impacts of Petroleum

432 pages, 40 pages of illustrations, maps, charts and graphs—Price $5.00.

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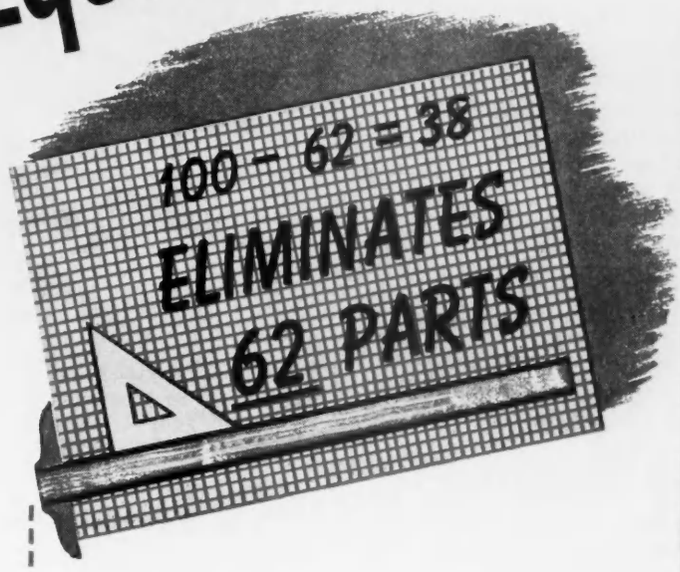
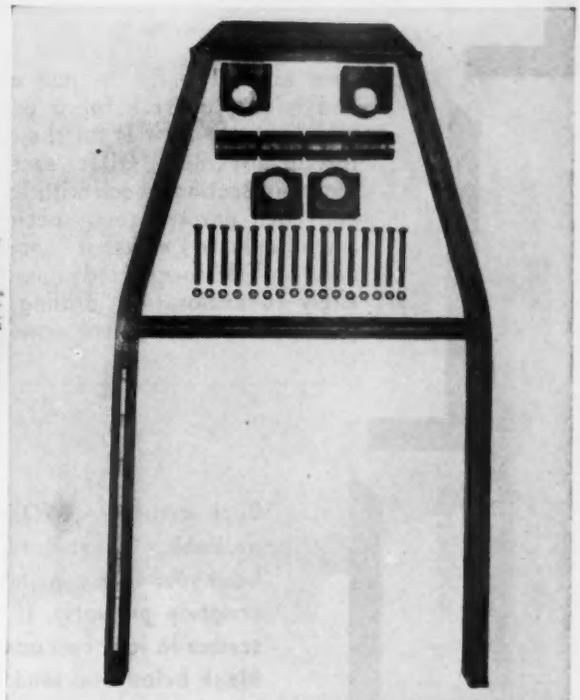
New CABOT Equalastic Bearing

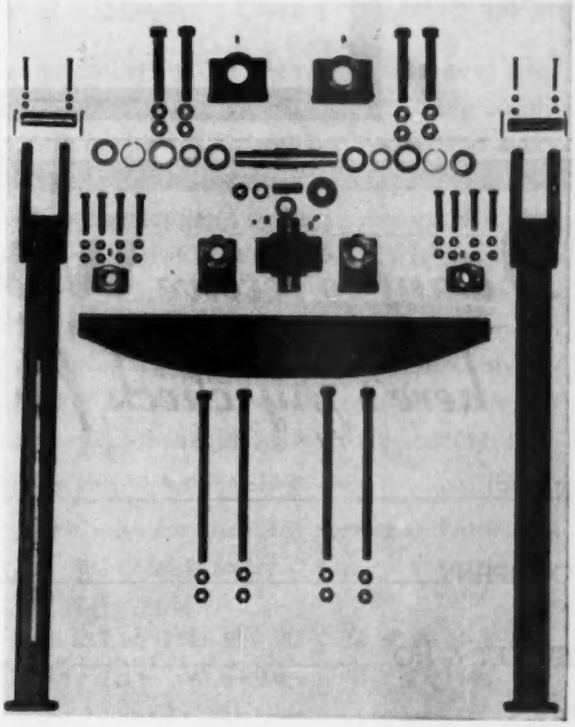


This new Bearing Assembly combines Evener Beam and Pitmans in one piece plus the Equalastic Bearing, four clamps and 16 sets of bolts and nuts . . . total parts: 38. The conventional bearing assembly contains 100 parts, many finely machined, produced to close tolerances and all subject to wear, rust and maintenance. The Cabot Equalastic Bearing consists of a single alloy steel shaft with four heavy rubber bushings vulcanized to it. On the outside of each rubber bushing, two steel half shells are vulcanized, with space between halves to allow for compression clamping. It's simple . . . it's time-saving . . . it requires no lubrication or maintenance!

Now available on all Cabot pumping units!

The New Way





The Old Way

Distributed Exclusively by Jones & Laughlin Supply Company, Tulsa, Oklahoma

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"I like WORLD OIL because I can flip right to the Drilling Section and be sure that every page—editorial and advertising alike—concerns information of top interest to me as a drilling contractor."

That comment hits the nail on the head and is just as true for a production or pipe line man as it is for the drilling contractor. WORLD OIL's sectionalization plan (six sections, each with its own cover and each devoted to a special phase of the oil industry) makes it—more than ever before—THE specialized paper devoted entirely to exploration, drilling, producing, pipe line operations and management.

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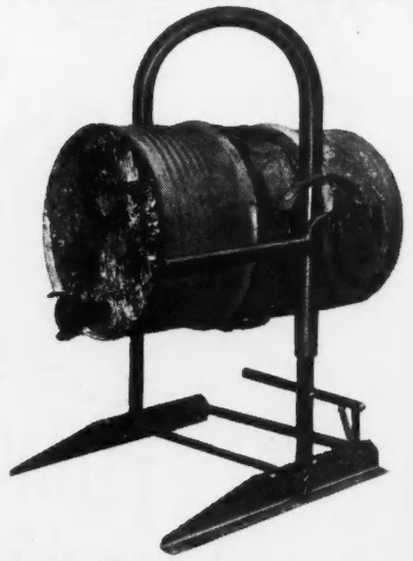
Return to **P. O. Box 2608** **Houston 1, Texas**

EQUIPMENT and SERVICE SUPPLIERS' NOTES



BARREL STAND—The Western Safety Barrel Stand will be manufactured and distributed by Henry H. Paris Distributor, Inc., which has purchased all patents covering the device.

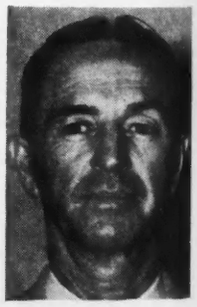
Henry H. Paris Will Manufacture Western Safety Barrel Stand

Henry H. Paris, president of Henry H. Paris Distributor, Inc., announced the purchase of all patents covering the Western Safety Barrel Stand from Wimbish Sweatt, et al. The company has purchased the manufacturing facilities of Western Barrel Stand Company of Corpus Christi, Texas. The new owner will manufacture the stands and will appoint exclusive distributors for restricted territories in the U. S.

The Western Safety Barrel Stand is a device for holding 55-gallon barrels so that they can be tilted for dispensing the contents. The barrel is suspended by a band around its center in an inverted U frame which is pivoted to the base of the stand. It can be latched in horizontal, vertical or 45-degree angle positions by means of a tilting lever on one of the U frame legs.

Greenstreet Is Manager of New Reed Office in Midland

W. H. (Buck) Greenstreet has been appointed to head the new Midland, Texas, offices of Reed Roller Bit Company. Greenstreet, who has completed 15 years of service with the company's Western Sales division, was formerly located in Lubbock, Texas. His new office is in the McClintic Building, Midland.



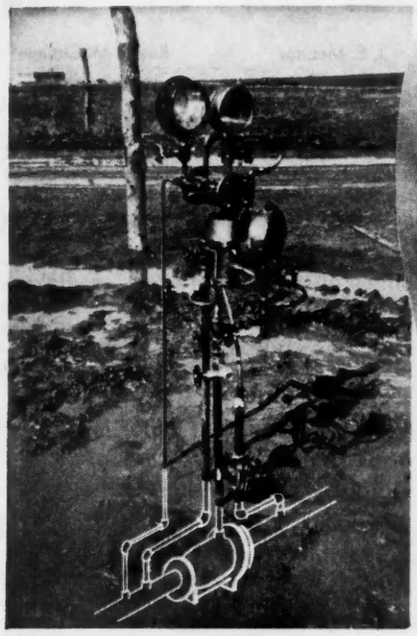
W. H. Greenstreet

Parkersburg Fieldman Transfers

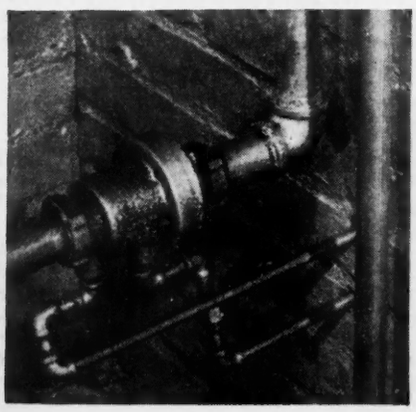
John R. Mase, fieldman for Parkersburg Rig and Reel Company, has been transferred from Tulsa to Oklahoma City.

IN OILFIELD SERVICES

the FLEXFLO NEVER FAILS



In this automatic differential-controlled shut-off installation, the Flexflo itself is buried several feet below ground level, with only the controls accessible . . . proof positive of Flexflo dependability.



On this automatic sprinkler control service, the Flexflo is isolated behind a fire-wall, the solenoid operator within reach on the other side.

CAN'T STICK — CAN'T SLAM — CAN'T WEDGE OPEN

When you're looking for reliability—when you want a valve that gives continuous trouble-free service under the toughest of working conditions, there's no need to look further . . . Grove Flexflo surpasses every expectation. Its great sensitivity and smooth instantaneous response enable it to react to the slightest change in control pressure. With the Flexflo, you can handle line pressures up to 1000 p.s.i. It resists the abrasive action of sand-laden gas and oil and is entirely self-compensating for the slightest degree of wear. What's more, there are no metallic moving parts to corrode or cause the troubles commonly encountered in conventional type valves. You merely install it and forget it from then on. No maintenance is required, no time-wasting shutdowns . . . the Flexflo always does its job without fail.

Make the Grove Flexflo your choice for unending service and unfailing performance. Write for the full details, today.

GROVE REGULATOR COMPANY
65th & Hollis Street Oakland 8, Calif.

Factory Branches: 3608 Navigation Blvd., Houston, Texas; 1930 W. Olympic Blvd., Los Angeles 6, Calif.

GROVE FLEXFLO "PUTS PRESSURE TO WORK" REMOTE CONTROL VALVE

The deeper you go the greater the need for Slush Pump parts that will handle greater pressures and last longer. Old methods of producing Piston Rods are inadequate. Harder rod surfaces and tougher cores are necessary.

Falcon, with Inductioning Hardening methods, uses a greater tensile alloy steel than ever before. This makes for greater resistance to bending stresses and for stronger rod threads.

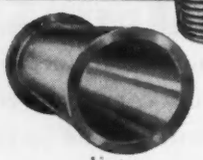
Sold through leading supply stores everywhere

Induction Hardening also means a uniform hardness the full length of rod. Heavy grinding into hardened surface to obtain straightness is unnecessary, therefore no "spotty" areas subject to rapid wear.

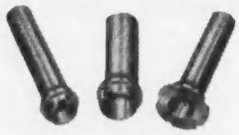
Induction Hardening is the answer. Order Falcon Induction Hardened Rods.

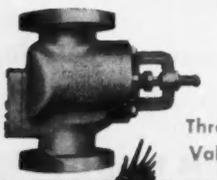
Send for Falcon Bulletin No. 106

OTHER FALCON PRODUCTS

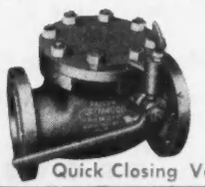

Liners

Pistons


Swivel Wash Pipes


Throttle Valves

Check Valves


Quick Closing Valves

FALCON PRODUCTS *LAST LONGER*

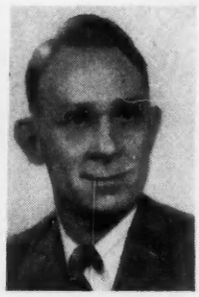
FALCON PRODUCTS, INC.

POMONA, CALIFORNIA

BRANCH WAREHOUSES: HOUSTON, ODESSA, WICHITA FALLS, TEXAS • CASPER, WYO. OKLAHOMA CITY, OKLA. • SHREVEPORT, LA. • BAKERSFIELD, LONG BEACH, CALIF.

Export Representative: Guy E. Daniels, 30 Rockefeller Plaza, New York 20, N. Y.

EQUIPMENT and SERVICE SUPPLIERS' NOTES


J. E. Meador

Roy B. McCannon

Baker District Manager Visits Venezuela; Meador Is Promoted

Roy B. (Cocky) McCannon, district manager at Bakersfield, Calif., for Baker Oil Tools, Inc., visited Eastern Venezuela on a trip of several weeks duration on company business.

J. E. (Jim) Meador has been appointed district manager of Baker's Rocky Mountain area, with headquarters at Casper, Wyo. Meador has been with Baker since July, 1943, in sales and service work principally in the Los Angeles Basin.

Halliburton Makes Field Changes, Forms Central Texas Division

Halliburton Oil Well Cementing Company announces changes in its field administrative setup at Duncan, Okla., and the creation of the Central Texas division with headquarters at Abilene. Harry P. Conroy, Fred R. Whitten and L. B. Meaders, formerly in charge of cementing, acid and plastics, and testing and tools, respectively, are now designated as regional managers with Whitten manager of the Northern, Meadors manager of the Central, and Conroy manager of the Gulf Coast region.

M. W. Reed, assistant manager of the export department at Duncan, has been transferred to Calgary, Alberta, Canada, as general manager of Howco, Ltd.

Marsteller and Melius Are Named Rockwell Company Vice Presidents

William A. Marsteller, Chicago, and Robert P. Melius, Milwaukee, have been elected vice presidents of Rockwell Manufacturing Company, Pittsburgh.

Marsteller for the past several years has been manager of advertising and market research for the company, as well as vice president of Edward Valves, Inc., East Chicago, Ind. He is completing a two-year term as president of the National Industrial Advertisers Association.

Melius was recently placed in charge of sales for the newly created Power Tool division of Rockwell Manufacturing Company. He has been with the Delta Manufacturing division for 19 years, and has been sales manager of the Delta division since 1935.

Correction

On page 300 of the August issue of WORLD OIL, the photograph captioned "Tommy Johnston" was run in error. The picture was that of M. O. Johnston, Jr., general manager of M. O. Johnston Oil Field Service Corporation.

10 out of 12 attempts to free stuck drill pipe were successful with BLACK MAGIC

Oil Base Drilling Fluid

WELL NO. 1

Pipe stuck at 10,360 ft. Black Magic loosened it in one day after 34 days of jarring and working the pipe.

WELL NO. 2

Heaving shale "grabbed" the pipe at 1,800 ft. Black Magic, circulated 5 round trips freed the pipe.

WELL NO. 3

Pipe stuck at 10,286 ft. 50 bbls. of Black Magic spotted around bit. Pipe came loose after 5 hours.

WELL NO. 4

On a redrill job, pipe stuck at 3,556 ft. One hr. after Black Magic was circulated pipe came loose.

WELL NO. 5

Core barrel stuck at bottom (10,350 ft.). Black Magic spotted on bottom loosened pipe in 2 hours.

WELL NO. 6

On the same well as No. 5, bit stuck at 15,037 ft. Black Magic successfully freed pipe 9 hours later.

WELL NO. 7

At 9,450 ft. pipe stuck on a whipstock well. Pipe came loose in 45 minutes after use of Black Magic.

WELL NO. 8

12½ days after pipe froze in a deep well (17,696 ft.), and crude oil and emulsion mud were tried without success, operator resorted to Black Magic. Pipe raised 15½ ft. but would not come loose.

WELL NO. 9

Reamer stuck. Hole opened to 12¼" above reamer, but pipe still stuck. Black Magic freed pipe in 4 hours.

WELL NO. 10

150 bbls. crude oil and a vibration shot were unsuccessful. Black Magic was circulated for 28 hours. Operator decided to fish and during fishing operation pipe dropped down hole 550 ft.

WELL NO. 11

Pipe stuck when oil base mud diluted too much with diesel oil. Black Magic properties repaired and pipe came loose.

WELL NO. 12

Pipe stuck at 10,000 ft. on way out of hole. Mud displaced with Black Magic and pipe came free.

To date, Black Magic has been used in 12 wells where pipe was stuck. Ten of these jobs were successful. Not a bad batting average when you consider that Black Magic was used in most cases *as a last resort!* You can save tremendous expense in rig time and equipment by using Black Magic on stuck pipe jobs. If crude oil spotting, working the pipe and jarring fail, an expensive fishing job can be avoided, in most cases, by using Black Magic. Pipe will usually come loose within a few hours.

Black Magic penetrates clay mud cake

The most common cause for stuck pipe is an excess of clay mud cake formed during drilling by use of water base muds. Heaving shale and settling of cuttings are other frequent causes. The chemical properties of Black Magic when combined with diesel oil penetrate the mud cake and soften it. In the case of hydrous disintegrating shale, Black Magic, which has no water loss and forms a paper-thin pliable mud cake (about 1/64" thick) on the walls of the bore hole, tends to hold shale in place and prevent washouts. The lubricating qualities, the excellent plastering properties and the stable gel strength of Black Magic all contribute to loosening stuck pipe and clearing the hole of cuttings and debris.

For case histories on these 12 stuck pipe jobs, write for paper "Freeing Stuck Drill Pipe."

OIL BASE, INC.

130 ORIS STREET, COMPTON, CALIFORNIA

BRANCH OFFICES: Houston, Oklahoma City, Midland, Walters, Casper, Bakersfield, Long Beach, Ventura.

EXPORT: Petro-Tech Service Co., Caracas, Maracaibo, VENEZUELA; Elmer R. Smith, Caracas; G. Saavedra E. Hijos, S. de R.L., Mexico, D. F.

THE *Easy-to-handle* GEARED PIPE THREADER

RIDGID No. 4P's handles take the struggle out of carrying and putting on pipe

● Even when you feel like a Tarzan you appreciate the sensible balanced loop handles that make the 4P easy to pick up, carry and work with. Mistake-proof workholder sets to size *before* you put it on pipe, one screw to tighten, no bushings. 4 sets of 5 high-speed steel chaser dies give clean accurate threads on 2½," 3," 3½" and 4" pipe. Ratchet handle furnished—RIDGID Universal Drive Shaft and Power Drive available for power-threading. For perfect threads easily, order the RIDGID 4P from your Supply House.

RIDGID

WORK-SAVER PIPE TOOLS

THE RIDGE TOOL CO. • ELYRIA, OHIO

EQUIPMENT and SERVICE SUPPLIERS' NOTES

Eugene C. McCann

Howard Reid

Totco Announces Appointments In Louisiana and Gulf Coast

Ray O'Rear has been promoted to Gulf Coast division manager for Technical Oil Tool Corporation, Ltd. He has been with the company several years, working in West Texas, Louisiana and, for the past year, Houston. He will continue to headquarter in Houston.

Ray O'Rear

Howard Reid has joined Totco's Houston office. He has had oil field experience in Louisiana and Mississippi.

Eugene C. McCann has been named field engineer at Lafayette, La., replacing John L. Brown.

Scarborough Joins Butler as Manager of Oil Field Division

E. M. Scarborough, Jr., Major, U. S. Air Force, has resigned his commission after 16 years' service to rejoin Butler Engineering Company, New Orleans, as manager of the Oil Field division.

E. M. Scarborough, Jr.

A graduate of Louisiana State University in 1935, he received his reserve commission after National Guard and ROTC service. Scarborough worked for Shell, Stanolind Oil and Gas Company, and W. T. Burton, independent operator, until October, 1940, when he reported for active duty as a first lieutenant in the Air Force. He left the service in January, 1946, and joined Butler Engineering Company as a field sales representative. He again entered the Air Force in October, 1947. During the past two years he has served in Korea and Japan, as well as at U. S. air bases.

Bovaird Representative Resigns

R. G. Wilson has resigned as sales representative in Tulsa for Bovaird Supply Company, and has moved to Casper, Wyo., where he will become an independent oil field material dealer.

NEW! Fast, powerful, high-capacity WALTER FIRE FIGHTING UNIT

Combines many unusual features for more effective control of oil and gasoline fires.

WHEN A FIRE STRIKES, every second counts... in getting to the scene, in getting the fire under control. On both essentials, Walter Fire Fighting Units are a great advance over existing equipment. No matter when or where the fire occurs, this Walter unit gets there fast and unfailingly, despite mud, sand, snow, slippery surfaces or grades . . . bringing tremendous fire-snuffing power with it.

This giant 240 hp. Walter Tractor Truck, is equipped with 1,000 gals. of water, 90 gals. of foam liquid for mixing, 800 lbs. of carbon dioxide, together with auxiliary pumps, metal ladders, cutting equipment and hand fire extinguishers. It has three ground-sweeping nozzles, two turret nozzles and three handline nozzles, which can discharge a total of 4,800 gallons of fog-foam mixture per minute, at 300 lbs. per square inch pressure.

Featuring the famous Walter Four-Point Positive Drive, this unit provides 100% traction in all four driving wheels. This fact, plus the extra large rolling diameter of huge, low-pressure tires, assures all-surface, all-season transportation. The unit accelerates to 45 mph. in one minute.

Recently designed and adopted for airport rescue and fire control work, this Walter unit incorporates the latest, approved aeronautical emergency fire-fighting techniques. WRITE TODAY for literature giving complete details and specifications.

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FOR SALE

■ ROTARY equipment almost new, only used few days, 1800' PK rods, Drill collar 30'x4¼" with 3½" box, King water swivel 1¼", PK slips, hoist plugs, overshot. Complete outfit $4500 or will divide. We handle new and used spudders, rotaries, core drills, pipe, tools, cable. Fishing tools and equipment rented. Pressey & Son, Pueblo, Colo.

■ Oil Leases in Western Canada for sale or development. Address: Box 31-W, c/o World Oil, Houston, Texas.

1—129' x 24' #17 R GC galvanized 537,000 drilling derrick complete w/5' Steel substructure for derrick and motors—used on six wells. 1—126' Std Parkersburg 437,000# angle Iron Derrick. 1—200 Ton Oil Well Crown Block—used 1 year.

H. O. GRACE,
632 Wichita National Bldg.,
Phone 2-1474 Wichita Falls, Texas

FOR SALE: 1 McNeely H-8 vibrating mud screen, 10 HP Waukesha Butane engine power and 105 BBL mud tank (3' x 7' x 28') made by M & V Tank Co., using ¼" Plate, 3" angle iron braces and 8" H beam skids. Used in making 3500 ft. of hole with jet oil. A. D. McDuffie, 242 Nacol Building, Wichita Falls, Texas.

For Sale
USED OIL FIELD GAS ENGINES

- 3—**Model 145 GKU Waukesha special oil field units** with gas engine starters, gas, gasoline and butane burning equipment, and otherwise standardly equipped, less power take-off, mounted on oil field type steel skids. Location Oklahoma City, Okla.
  Price $2,820.00 ea.
- 2—**Model 6-PCS-1879 Buda standard oil field power units,** with gas engine starters, gas gasoline and butane burning equipment and otherwise standardly equipped, less power take-off, mounted on oil field type steel skids. Location Duncan, Okla.
  Price $6,624.00 ea.
- **These engines** are practically new guaranteed accordingly.
- 1—**R-225 Climax 8 cylinder engine** complete with gas gasoline and butane carburetors, and engine starter, mounted on oil field type steel skid. Location Duncan, Okla.
  Price "as is" $1,100.00

Address: Box 38W, c/o World Oil, Houston, Texas.

HELP WANTED

■ NEW foreign and domestic Oil Employment Directory. Over 500 listings in drilling, production, refining, natural gasoline, pipelines, geological, exploration, supplies, manufacturers, services; and trucking, refinery and pipeline contractors, showing where to apply for jobs. Price $5.00. Oil Industry Mailing List, Box 2603, Tulsa, Okla. (Our 29th Year).

HELP WANTED

WANTED

Midwestern manufacturer seeks man with engineering background experienced in the sale of equipment to the oil industry. Familiarity with internal combustion engines desirable. State qualifications, age, and compensation required in first letter. Address: Box 39W, c/o World Oil, Houston, Texas.

Instrument Engineer

A major oil company has opening for Instrument Engineer with at least three years of chemical plant or refinery experience. Preference given to man with engineering background. Write Box 35W, c/o World Oil, Houston, Texas, giving qualification, education, experience, age, and attach a small inexpensive passport photograph.

Geophysicist

A well established, major geophysical company wishes to employ a highly qualified party chief. The individual must have a college degree, a minimum of 2 years actual experience as a party chief, and be willing to move with the seismic party. This is a solicitation for a man of outstanding calibre who has the capacity to advance in a company with a high regard for its present good reputation. Give age, education, experience, salary expected, references, and all other appropriate details in first reply. Our employees know of this ad. All replies will be treated confidentially. Reply to Box 40W, World Oil.

SITUATIONS WANTED

■ **Attorney,** experienced, licensed in Texas 1936, LL.B. Degree, B.A. Degree Accounting, employed in responsible position for State of Texas, married, desire position with reputable independent oil company doing land or legal work. Best of references. Interview available upon request. Address: Box 37W, c/o World Oil, Houston, Texas.

Wish to represent oil tool company or manufacturer of oil field products in California. Native Californian capable, energetic. Know all phases of oil production, sales and service. Twenty-five years field experience. Now employed in executive sales capacity. Illness in family makes change necessary. Address: Box 41W, c/o World Oil, Houston, Texas.

NOTICES

■ "UTAH'S FIRST DISCOVERY"—1600 acre lease beginning 1½ miles north east. All sec. 12, all 1—E½ 11. NWNW13 5S R22E. D. Miller, Box 1581, Station D, Los Angeles 7, California.

EQUIPMENT and SERVICE SUPPLIERS' NOTES

Frank Kenefake

Clarence Sublett

Franklin Supply Company Is Named Bethlehem Equipment Distributor

Franklin Supply Company, Chicago, has been appointed distributor in Illinois, Indiana, Michigan and Kentucky for Bethlehem Supply Company pumping units and rotary equipment. Frank Kenefake of Grayville, Ill., and Clarence Sublett of Mt. Pleasant, Mich., have completed a course at the Bethlehem Service School in Tulsa on field service of pumping units.

The company has established a new yard and storage facilities at Mears, Mich., to serve western Michigan producers. Other Franklin offices and warehouses are located at Tulsa, East Chicago, Ind., Mt. Pleasant and Grayville.

Announcement was made also of reelection of all officers of the company, including Jene Harper, president; Stanley Martin, executive vice president; L. H. Strouse and Roy Wood, vice presidents; Jean Harper, secretary; and Al Mitchell, treasurer.

New Acid-Treating Station Serves Permian Basin, West-Central Texas

The Western Company has opened a new acid treating station at Snyder to serve the oil industry on the east side of the Permian Basin and in the West-Central Texas area surrounding Abilene.

W. T. Ivy, formerly assigned to Western's Odessa station, is to be manager for the company at Snyder. Other key personnel at the new treating unit will include Cy Helm, Ted Bicknell, Jr., Jimmy Wilkins and Johnny Bowden.

The Snyder station will serve oil development operations in Garza, Scurry, Borden, Dawson, Howard, Mitchell, Noland, Coke, Fisher, Jones, Haskell and Taylor counties.

The Snyder station will start operating with several acid trucks, including a recently completed 2000-gallon unit powered by a 350-horsepower engine, which furnishes motive power to the truck and also, through the use of a specially designed transmission, drives the acid pumps.

LEASES, DRILLING, ACREAGE, ETC.

■ **Recent strikes have focused attention on Montana's deeper oil zones and major companies are moving in fast, drilling and leasing. We buy direct in the field, sell direct to our customers. Write LANDOWNERS ROYALTIES COMPANY, Box 1225, Great Falls, Montana.**

■ For Leases, Minerals and Royalties, West Texas, Write Onas Ferguson, 1411 West Tennessee, Midland, Texas.

New Books, Maps and Movies

Mechanical Vibration

The second edition of C. R. Freberg and Emory N. Kemler's practical, elementary treatment of mechanical vibration has been amplified by the addition of two chapters: Sound and Beams. This edition, like its predecessor, lays great stress on the simple treatment of problems from a basic analysis. It also offers a wide range of practical problems, methods and formulas to use in solving them, and directions for practical applications.

The book treats of vibrations without damping, damped vibrations, vibration of systems with several degrees of freedom, vibration isolation and absorption, equivalent systems, beams, sound, the mobility method, and mechanical and electrical models of vibration systems. These features are combined to help both the student and the engineer solve practical vibration problems with a minimum of complication and theorizing.

The book may be obtained from the publisher, John Wiley & Sons, Inc., New York City, or from the Book Department, WORLD OIL, P. O. Box 2608, Houston, $3.75.

Clay Deposits

The Bureau of Economic Geology and the Research Laboratory in Ceramics, both research departments of The University of Texas, have published a cooperative report, "Clay Deposits of the Cisco Group of North-Central Texas," by F. B. Plummer, H. B. Bradley, and F. K. Pence. This is a report of 44 pages and is accompanied by 34 text figures and eight plates. Cross sections of certain commercially important clays in North Central Texas are given, and the maps show extent of outcrop and principal exposures of Quinn, Curry, and Craddock clays in Brown, Eastland, Stephens, and Young counties.

Bureau of Economic Geology, The University of Texas, University Station, Box B, Austin 12, Texas, $1.

First Petroleum Analysis

Of historical interest to oil men is the reprinting in facsimile of "Report on the Rock Oil, Petroleum," a booklet first published in 1855. B. Silliman, Jr., professor of general and applied chemistry, Yale College, made the first chemical analysis of petroleum from samples taken from the oil springs on the Hibbard farm, Venango County, Penn. His report to the founders of the Pennsylvania Rock Oil Company of New York has become a chemical classic.

The present edition, "The First Scientific Analysis of Petroleum," has an introduction by Paul H. Giddens.

Paul H. Giddens, Allegheny College, Meadville, Penn., $1.25.

Secondary Recovery in Kansas

"Summary of Secondary Recovery Projects in Kansas—1948" is a joint preparation of the Interstate Oil Compact Commission and the Kansas Corporation Commission, based on information compiled by Albert E. Sweeney, Jr., director of the Compact's Secondary Recovery division.

The report covers all water flood projects and gas injection projects in Kansas, with details about individual projects, such as production figures, acreage, and information on the producing formation.

Interstate Oil Compact Commission, P. O. Box 3127, State Captitol, Oklahoma City 5.

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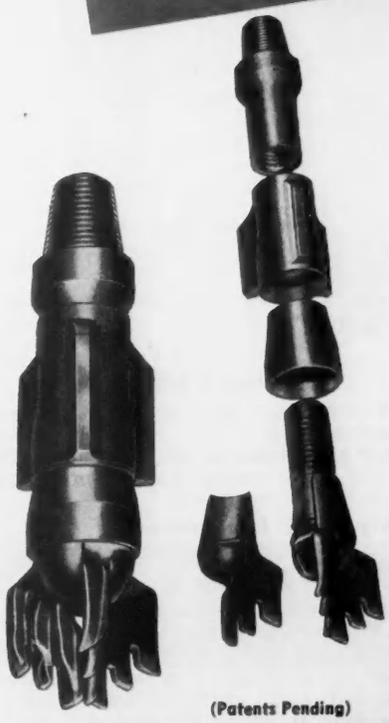

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drill faster!

If you need to cut costs, you need to use Hawthorne Replaceable "Rock Cutter" Bits!

That's why so many of today's cost-conscious exploration drillers are using Hawthorne Bits in 95% of their drilling operations.

You, too, can probably double your drilling efficiency and cut cost-per-foot in half with Hawthorne "Rock Cutter" Bits!

See GEOPHYSICAL DIRECTORY or COMPOSITE CATALOG for lists, parts, prices—or write for illustrated catalog. Hawthorne Bits are available in a range of sizes to fit any drill.

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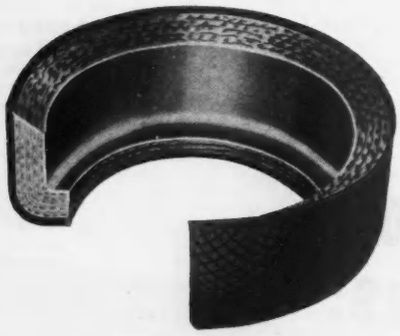


On The Original
ARMORFLEX
VALVE CUPS

Nylon is well known for its strength and wear resistance. Popularized by the hosiery industry, it is also used extensively in many industrial products which must stand up under extremely heavy service, for example: the large airplane tires which are given such terrific punishment in takeoffs and landings.

Utilizing the superior strength and wear resistance of Nylon, we have developed ARMORFLEX Valve Cups whose outer layers are made of this material—the first composition valve cups to employ Nylon as a wear-resisting armor.

Operators who have used ARMORFLEX cups during the year they have been on an experimental basis report much longer runs than with ordinary cups. They also say that ARMORFLEX cups do not tear as easily as the ordinary kind, reducing clogging of valves by pieces of torn cups. Costing only a few cents more, ARMORFLEX cups offer an excellent means of insuring a few days, weeks, or months longer run before pulling.

To order, specify same catalog number and density as for ordinary cups and include the word ARMORFLEX in the description. Look for the Nylon armor, and for the ARMORFLEX stamped in yellow on every cup and box. Accept no substitutes which are "just as good."

SOLD BY SUPPLY STORES

WALTER O'BANNON CO.
TULSA 1, OKLAHOMA

ARMORFLEX O'BANNON ARMORFLEX

SQUEAKS from the BULLWHEEL

Wonder of the World

The Irish driller returning from a visit to the old country was passing through customs.

"Do you have anything to declare?" asked the customs officer.

"Only a bottle of water," the driller replied, explaining that it was holy water.

Long experience had taught the officer to take nothing for granted so he asked to see the bottle. The driller protested, but the customs man snatched it from him and took a whiff of the cork.

"It's whiskey!" he cried.

"Glory be!" exclaimed the old driller fervently, "a miracle!"

Put Up or Shut Up

A Texan was playing poker with a couple of Englishmen. He was quite surprised upon picking up one of his hands to see four aces in it.

"I'll wager a pound," said the Britisher on his right.

"Ah don't know how y'all measure your money," drawled the Texan, "but ah reckon ah'll have to raise yuh about a ton."

She Was Fit to Pop

A bewildered man entered a ladies' specialty shop: "I want a corset for my wife."

"What bust?" asked the clerk.

"Nothin'. It just wore out."

Raw Deal

"Daughter, I object to those one-piece bathing suits."

"But Mother, I really think I should wear something."

Who Gives Lessons?

Serious young man: "Do you enjoy Kipling?"

Giddy girl: "I don't know—how do you kipple?"

What a Man

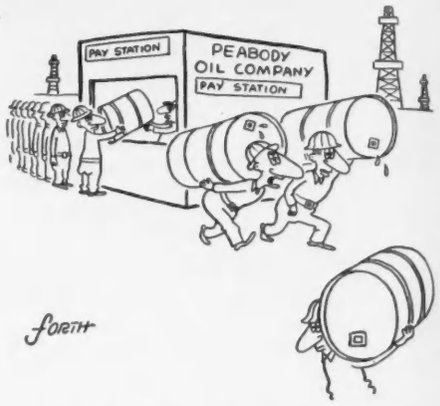
"Tell me, sir, who was braver than Lancelot, wiser than Socrates, more honest than Lincoln, wittier than Mark Twain, and more handsome than Apollo?"

"My wife's first husband."

Dog Eat Dog

A South African native was told he had to be taxed because the government, like a father, protected him from enemies, cared for him when he was sick, fed him when he was hungry, gave him an education and, for these reasons, needed money. The old native said:

"Yes, I understand. It is like this. I have a dog, and the dog is hungry. He comes to me and begs food. I say to him, 'My dear faithful dog, I see you are very hungry. I am sorry for you. I shall give you meat,' then I take a knife, cut off the dog's tail, give it to him and say: 'Here, my faithful dog, be nourished by this nice piece of meat.'"



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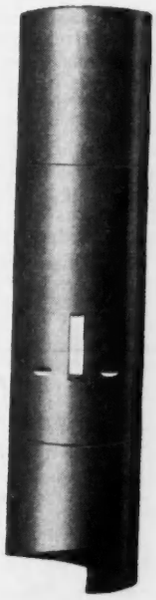

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EXPORT OFFICE: 30 Rockefeller Plaza, New York 20, N. Y.

Flashes from the BEACON

WHAT DOES POLIO HAVE TO DO WITH OIL FIELD EQUIPMENT? Well, maybe nothing, but the BS&B BEACON is a family magazine as well as an industry magazine, and we know families everywhere want the up-to-the-minute score on this summer-blighting illness. So our September BEACON carries a section, "Polio Facts for Parents," in which we look at the disease from a number of viewpoints and report our findings in simple, everyday language. As a parent, you'll learn how important you are in protecting your family if polio strikes your town.

* * *

"Pop" Kenyon, our beloved "Observations" man, got a real thrill at the BS&B Kansas City picnic this summer. Pop, our only employee with more than forty years' service, received a service pin set with diamonds as a highlight of the evening program. More than 1,600 employees, their families, and friends cheered Pop. Pop, incidentally, is Office Manager at Kansas City when he can tear himself away from his "Observations."

* * *

More than 280 employees received pins for service ranging from five years to forty. In fact, total years represented added up to 2,625! Sounds like a lot of oil field equipment, doesn't it?

* * *

Extra protection for lease operators and chemical companies is now available on the newly designed BS&B Vertical Vacuum Vent Valve. A flame arrestor bank of rolled aluminum construction has been built into the old reliable VVH to prevent flashbacks into storage tanks containing oil, solvents, naphtha, glycol, etc., at atmospheric pressure. The full story of the new Flame Arrestor will be told in the September BEACON.

* * *

We'd like to send you the BS&B BEACON regularly, if you're not one of our "subscribers" now. No charge, of course. Just a request on your company letterhead will do the trick.

Write to:

BLACK, SIVALLS & BRYSON, INC.
Industrial and Public Relations Division
720 Delaware
Kansas City, Missouri

SQUEAKS from the BULLWHEEL

Quick Action

Flying through the corridors of the Pentagon, the little pigeon sat down on a window sill to rest. Close behind came another pigeon who stopped and said:

"Where are you bound for?"

"Over to Section M to deliver an order," panted the first bird.

"What order is that?" asked the other.

"Number X-1234."

"Well, get moving," chirped the second bird, "I got the order that rescinds it."

Home Remedy

"When I get a cold I buy a bottle of whiskey for it, and within a few hours it's gone."

"My, that's a short time to get rid of a cold."

"Rid of the cold, hell. It's the whiskey that goes."

Hand Made

An English woman connected with the British War Department was visiting American plants. She remarked that Americans were wonderful. Everything was done by machinery. Later she was taken through a huge steel mill, and here again was impressed by the labor-saving machinery. About noontime, an executive suggested riding downtown in his car for lunch. When she got into the car a gust of wind made the good woman's dress fly up around her waist.

"Good heavens," she exclaimed, "don't you Americans do anything by hand?"

"I see you struck oil today, dear."

Brute

"I hate that man."

"Why, what happened? I thought that you liked him so much."

"He said I couldn't whistle and just to show him I could, I puckered up my mouth just as sweet and round, and what do you think he did?"

"How should I know?"

"Well, the fool just let me whistle."

Sponger

"I'm going to fire that butler. He's all wet."

"Have you been having an argument?"

"No, but my wife's been having a bath."